JULY 14, 1952

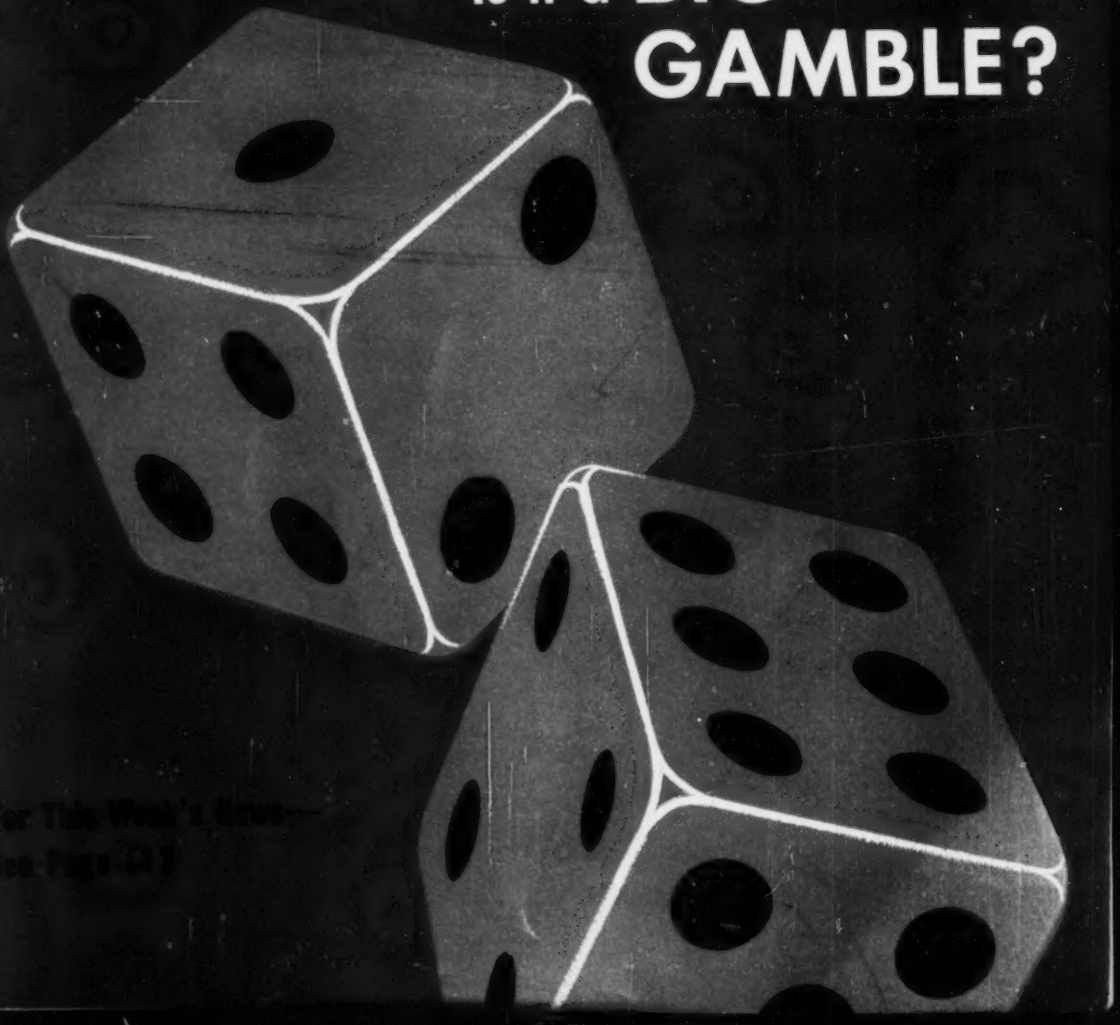
Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION

Aluminum for Distribution—

Is it a BIG GAMBLE?



For This Week's News—
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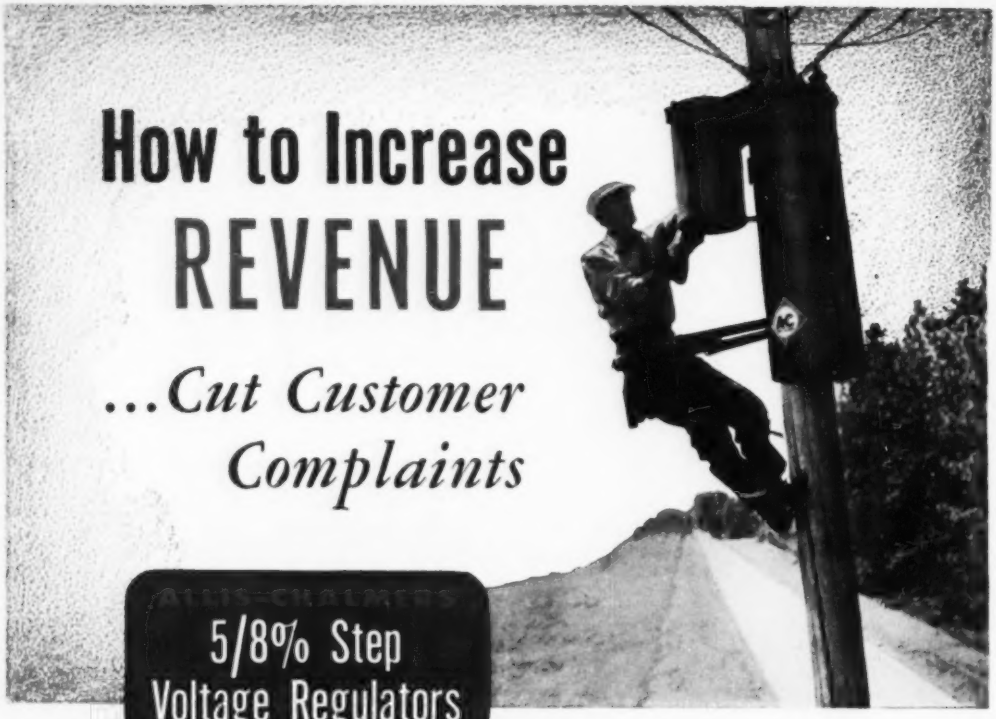

Power Company Regulates Entire System — finds it pays off with double return

HERE'S HOW ONE electric power executive puts it: "We have regulated our entire system with Allis-Chalmers AFR (power) and JFR (distribution) regulators and we have noticed a substantial increase in revenue. Also, we have completely eliminated all complaints due to low voltage and this alone is worth more than the small cost of the regulators."

You get properly regulated voltage with Allis-Chalmers ⅝% step voltage regulators. The narrow ± 1 volt band provides accuracy. The voltage integrator permits the regulator to meet specific load conditions. And 20% range of regulation makes it possible to boost capacity, or to extend feeder length at minimum expense.

Allis-Chalmers Distribution Regulator

RATINGS AVAILABLE	
	7620 VOLTS — 15-50-100 AMPS
	5000 VOLTS — 50-100 AMPS
	2500 VOLTS — 100-200 AMPS

TIME TESTED UNIT OFFERS REGULATION AT LOW COST

Twenty years of design and development bring you proved durability at low cost. Take the tap-changing mechanism for example. It has stood up under life tests of 5,000,000 operations — equivalent to 100 years of operation. Low initial cost, long life, and low maintenance requirements add up to low cost regulation with Allis-Chalmers ⅝% step voltage regulators.

Get the complete story. Write or call your nearby A-C district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3748

ALLIS-CHALMERS

Originators of ⅝% Step Regulation

AMAZING ISN'T IT?

Electrical World's survey-experienced editors have been floating around the office ever since the results of their survey on Application of Aluminum to Distribution have been checked. Questionnaires had been sent to 57 electric utilities, 56 replied though 4 too late to be of use in the survey on page 126.

Probably the unheard-of rate-of-return was due to the great interest of the industry in the growing use of the white metal. Using the information supplied by the survey and five articles by authorities on the application of all-aluminum in the distribution field, the editors have prepared for the industry this issue.

Both management and engineers can use this material to answer for themselves the question we pose on the cover—Aluminum in Distribution, Is It a Gamble?

POWER FOR STEEL MAKING

Last month with the nation's steel-making industry working at only 12.5% of capacity, output of the nation's central stations continued at a rather high level. To outsiders calling for an explanation Electrical World passed on the information that the big steel producers make most of their electric energy in their own plants, buy comparatively little.

An example of such an industrial power plant is that of the United States Steel Co at its South Works at South Chicago, Ill. Here the largest tandem-compound, turbo generator for industrial power production has been installed. It has a capacity of 60,000 kw at 13.8 kv, 3-phase, 60 cycles.

The economics behind the installation and the engineering details will be explained in the July 28 issue.

RECLOSERS NEED MAINTENANCE

That reclosers will improve system operation and service is generally known by the industry. That reclosers cannot be hung on a pole and forgotten might be equally well known but often the necessary maintenance isn't done or is done haphazardly.

But D. C. Allred, Westinghouse Electric Corp, believes that a well-planned service program for reclosers and sectionalizers pays off. He explains why in an article now scheduled for the July 28 issue.

Electrical World

Published for 78 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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Published weekly by McGraw-Hill Publishing Company, Inc. James H. McGraw (1860-1948), Founder. **Publication Office, 99-129 North Broadway, Albany 1, N. Y. Executive, Editorial and Advertising Office: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y.** Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

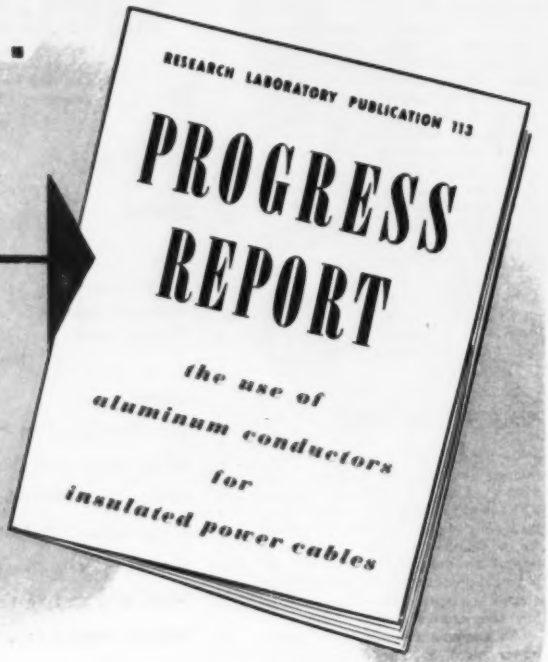
Subscriptions: Address correspondence to Electrical World—Subscription Service, 99-129 N. Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 36, N. Y. Allow ten days for change of address.

Subscriptions are accepted only from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields. Position and company connection must be indicated on subscription orders.

Single copies 35¢. For the United States and possessions $6 a year, $9 for two years, $12 for three years. Canada, $7 for one year, $11 for two years, $14 for three years. (Canadian money, at par.) Other Western Hemisphere, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Entered as second-class matter November 16, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in USA. Copyright 1952, by McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents.

IF YOU USE ELECTRICAL WIRES AND CABLES...

look into the possibilities of using aluminum conductors



This report includes information on: economics with aluminum, variety of designs available, wide scope of applications, analysis of operating records, and installation techniques.

The low cost and light weight of aluminum give it certain natural advantages for many types of insulated power cables. For example, you should consider cables with aluminum conductors for aerial and overhead circuits, or burial directly in the ground. Some plants have advantageously installed aluminum cables in conduit systems.

Section of pioneer 15kv paper insulated power cable with aluminum conductors. Manufactured by Okonite-Callender for a large New England utility and installed in spring of 1952.

Okonite has an extensive experience with aluminum. Hundreds of thousands of feet of Okonite cable with aluminum conductors are establishing excellent operating records with many of our customers. Accelerated emphasis during the last five years in our long-range development and testing program, has provided us with the widest background in the application of insulated aluminum cables.

You can get the complete story, including technical information, from Research Publication EW-113. Get it now, for a practical answer to important cable problems. Just fill out the coupon and mail it to the address below; a free copy of this Research Publication will be sent you promptly by return mail. The Okonite Company, Passaic, N. J.

THE BEST CABLE IS YOUR BEST POLICY

OKONITE

— insulated wires and cables

PRODUCT DEVELOPMENT DEPT.
The Okonite Company, Passaic, N. J.

Please send me Research Publication EW-113.

Name .....

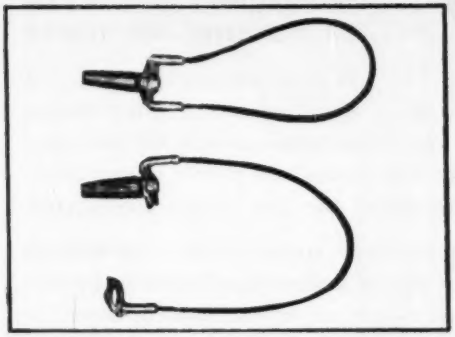
Company .....

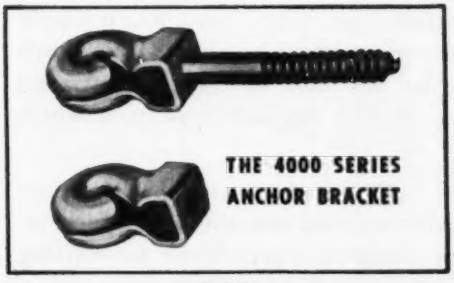
Street .....

City ..... State .....

Electroline AUTOMATIC DEAD-END

for Neutral Supported Multiple Conductor Service-Drop Cable





THE 4000 SERIES ANCHOR BRACKET

This Electroline Automatic Dead-End is designed for use with neutral-supported type of service drop. The insulation on the phase wires is not destroyed because these Dead-Ends grip only the bare neutral. This eliminates the possibility of shorting any phase. Available only for No. 6-AWG conductor. For automatic line Dead-Ends use the Electroline 3400 Series.

THE ELECTROLINE 3800 SERIES Automatic Dead-Ends lower construction costs because they are easily installed in a few seconds. This Dead-End is assembled as a one-piece unit with no loose parts to be dropped or lost. One end of the flexible bail is detachable for use with a spool-type insulator or other types of supporting anchorages now in service. This feature permits quick and easy installation with only one part, other than the conductor, to be handled by the lineman.

ELECTROLINE 4000 ANCHOR BRACKET — The 4000 Series Service Bracket, for use on permanently multi-grounded neutral systems (ideal for use with 3800 Series Dead-Ends as illustrated below), permits quick and simple insertion of a closed bail or loop—supports the cable at any angle. Installation costs are further reduced since this method of anchoring eliminates the insulator and insulator hardware.

WRITE FOR NEW BULLETINS FOR FULL INFORMATION

TALENT TO ORIGINATE
E
ABILITY TO PRODUCE

Electroline Company

4121 South La Salle Street • Chicago 9, Illinois

In Canada: POWERLITE DEVICES, LTD., TORONTO

MAKE YOUR *Sectionalizing Switch* ACCESSIBLE

Whether you are putting up a new line—or simply adding a sectionalizing point to an existing line—avoid the limitations of horizontally mounted conventional air switches.

THE "ARC-FREE" ALDUTI INTERRUPTER SWITCH CAN BE MOUNTED VERTICALLY

If it's a "remodelling" job, you can keep service interruptions to a minimum by completing the switch installations with the line *energized.* In fact, interruptions can be eliminated completely if provisions are made for a sectionalizing point when the line is first constructed.

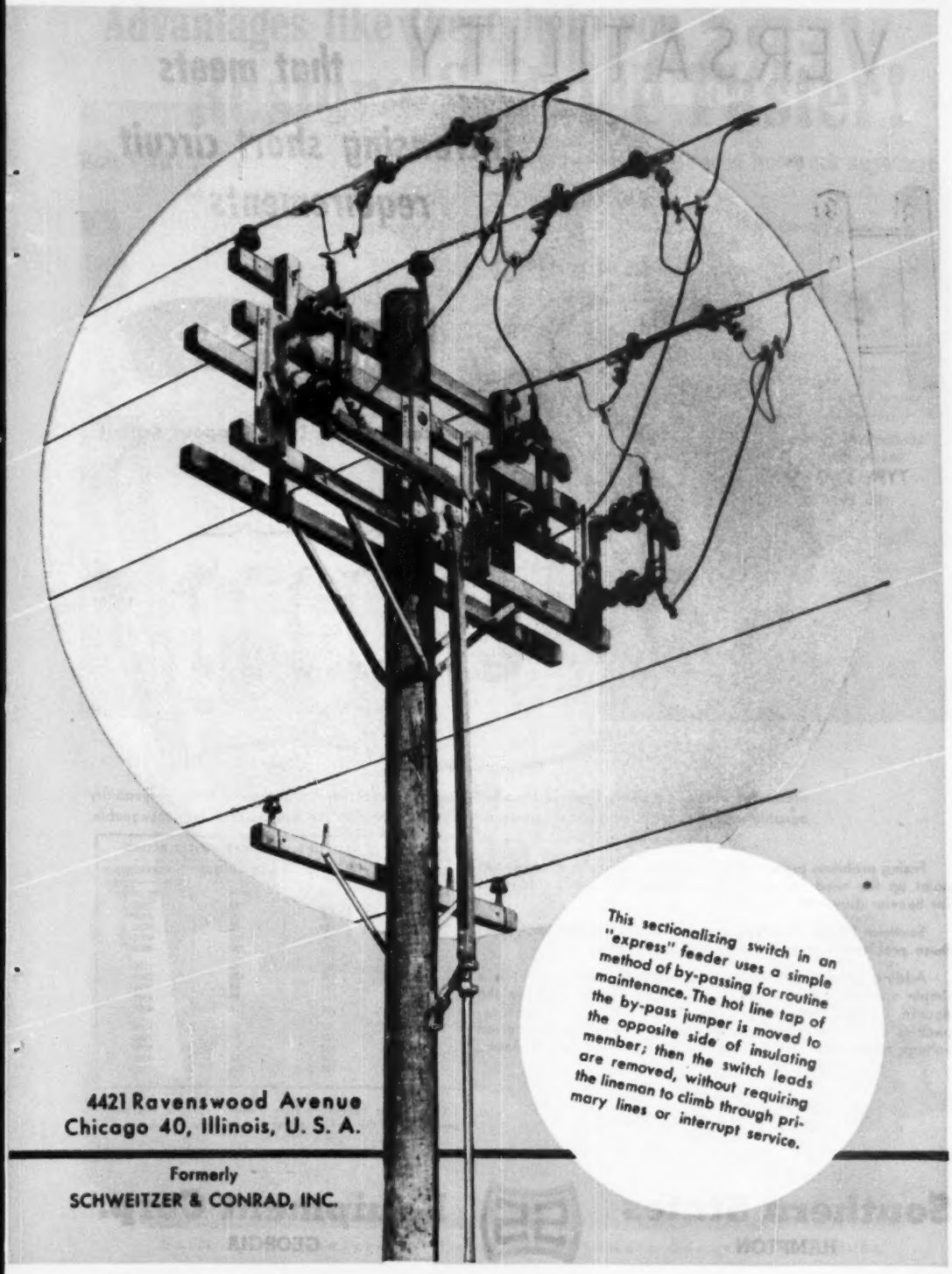
And whether the switch is going into new construction or an existing line, you get the obvious benefits of simple jumpering schemes to by-pass the switch for routine maintenance. Again, no service interruptions!

Of course, that's just part of the picture. Versatility of mounting is simply a by-product of the Alduti's *no-external-arc* switching ability. This switch can safely and positively interrupt line and cable charging currents, and load currents up to 600 amperes. With it you can revise your whole concept of sectionalizing.

Available in voltage ratings from 7500 through 34,500, Alduti Interrupter Switches are shipped in easily handled assemblies for quick installation. Get the complete story. Write for Catalog Section 760, or contact your S&C representative today.

S&C ELECTRIC COMPANY

In Canada, Powerlite Devices, Limited, Toronto



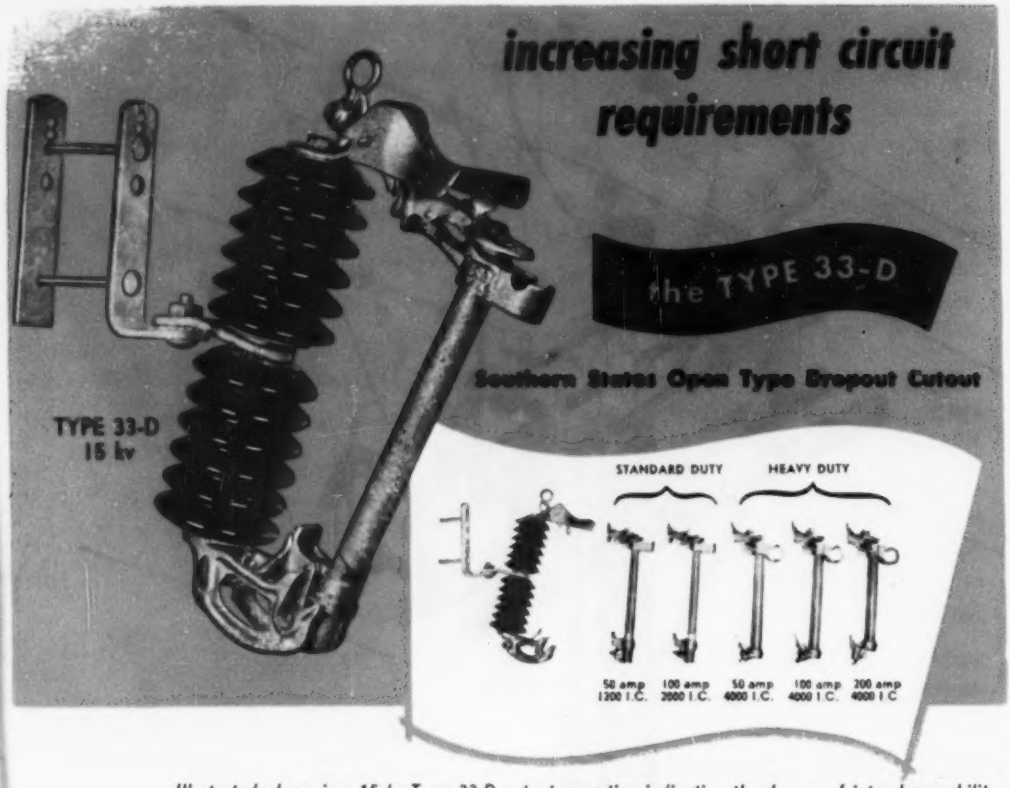
This sectionalizing switch in an "express" feeder uses a simple method of by-passing for routine maintenance. The hot line tap of the by-pass jumper is moved to the opposite side of insulating member; then the switch leads are removed, without requiring the lineman to climb through primary lines or interrupt service.

4421 Ravenswood Avenue
Chicago 40, Illinois, U. S. A.

Formerly
SCHWEITZER & CONRAD, INC.

VERSATILITY *that meets*

increasing short circuit requirements



Illustrated above is a 15 kv Type 33-D cutout mounting indicating the degree of interchangeability possible with this cutout. In a given voltage rating all fuse holders are mechanically interchangeable.

Fusing problems presented by increasing short circuit capacities point up the need for distribution cutouts that can be adapted for heavier duty—IN THE FIELD.

Southern States open type dropout cutouts, like the 33-D, meet these problems with interchangeable fuse holders.

Adding capacity to an installed Southern States cutout is a simple operation. By changing only the fuse holder and link the desired combination of continuous current and short circuit capacities can be obtained. For each cutout mounting of a given voltage rating, five fuse holders of different ratings are available.

CUTOUT RATING	MOUNTING CONTACT RATING	FUSE HOLDER RATING	
		CONTINUOUS	INTERRUPTING
kv	amp	amp	rms amp
5	100	50	1200
5	100	100	2000
5	100	50	4000
5	100	100	4000
5	200	200	4000
7.5	100	50	1200
7.5	100	100	2000
7.5	100	50	4000
7.5	100	100	4000
7.5	200	200	4000
15	100	50	1200
15	100	100	2000
15	100	50	4000
15	100	100	4000
15	200	200	4000

NOTE: When converting from a lower rating to 200 ampere rating, the brush contacts must also be changed.

Write for Bulletin No. 178-D

Southern States Equipment Corp.
HAMPTON GEORGIA

Advantages like these help you

Restore Service Faster!

Only FWD . . . the true 4x4 . . . offers you all these features that speed line work anywhere

Proper Weight Distribution

Only a true 4x4 gives you up to 50% of the weight on the front wheels. This gives you the extra traction needed to speed utility line work.

Full Torque P. T. O. . . . .

Utilizes full engine power through all transmission speeds. Exclusive safety lock prevents truck drive while boring.

High-Climb Oil Sump

Keeps oil pump constantly submerged. An FWD exclusive that lets you bore holes, set poles on steepest grades.

Two-Speed Aux. Transmission

Doubles the number of transmission gear ratios. Provides low gear ratio for full power at extreme low speeds in tough, cross-country operations.

Fully Compensated Drive

Three free-acting differentials compensate for differences in travel of all four wheels. Reduces drive line strains, eliminates needless tire scuffing.

Over 75 Matched Combinations of Trucks and Equipment

Now choose the exact mobilized tool that meets your requirements . . . and deal with only one source for complete service and supply.

DESIGNED WITH THE HELP OF VETERAN UTILITY MEN . . . FWD line construction and maintenance units handle your work . . . faster . . . safer . . . and at less cost. These mobilized tools get crews and equipment through to any location in spite of terrain or footing . . . speed work on the job . . . help maintain construction schedules or get service restored in a hurry. See your FWD dealer to get the facts on how FWDs can improve your service and earn more for each equipment dollar. The Four Wheel Drive Auto Co., Clintonville, Wisconsin. *Canadian factory*, Kitchener, Ontario.

Built by the makers of America's Foremost Heavy-Duty Trucks

350,000

HORSEPOWER

supplied by 194 NORDBERG GAS BURNING RADIAL ENGINES

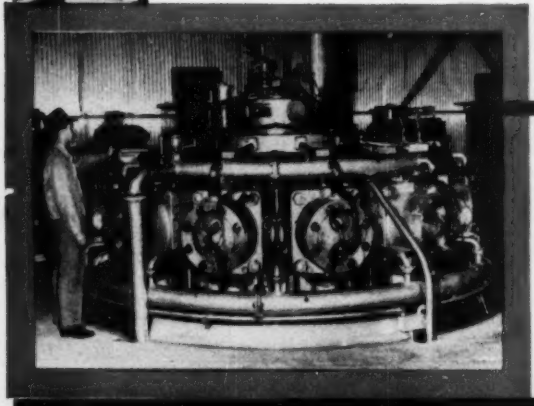
makes ALCOA'S Point Comfort Reduction Works the WORLD'S LARGEST Internal Combustion Engine Power Plant

★ A seventy per cent increase in aluminum smelting capacity at Aluminum Company of America's Point Comfort (Texas) Works has been made possible through the installation of seventy-four additional Nordberg spark-fired gas burning Radial Engines.

This power, added to that generated by the original 120 Nordberg spark-fired gas burning Radial Engines placed in operation in January, 1950, gives the Alcoa plant a total of nearly 350,000 horsepower—*by far the world's largest internal combustion engine station.*

Here, then, is another excellent example of the way in which Nordberg Diesel Engines, in sizes from 10 to over 10,000 hp in single units, are used to provide dependable, economical power for stationary and marine requirements all over the world.

NORDBERG MFG. CO., Milwaukee, Wisconsin



Important features of NORDBERG RADIAL ENGINES

- ☆ LOWER INVESTMENT COST
- ☆ LOWER INSTALLATION COST
- ☆ LOWER OPERATING COST
- ☆ LOWER MAINTENANCE COST
- ☆ LESS SPACE REQUIRED
- ☆ AVAILABLE THREE WAYS . . . as oil burning Diesels, as spark-fired gas engines, or as Duafuel engines

Applicable for industrial and municipal power plants and central stations . . . wherever compact, economical, dependable power is required. For full details covering Nordberg Radials, send for Bulletin.

P652

NORDBERG DIESEL ENGINES

This transformer is rated 30,000 kva single phase, Class OA—154,000—69,000—12,500 volts with load ratio control equipment.

THEY STAY YOUNG LONGER

with

DESIGN

CORONA IS ALWAYS a source of danger to your transformer. It produces local heat and chars insulation, causing the insulation to become electrically conducting.

Corona can develop any time due to voltage stresses within your transformer. When it does, your transformer will age prematurely.

SELECT CORONA-FREE DESIGN . . . because the performance you specify today is the performance you will need tomorrow and for years to come. You'll get transformers that stay young — longer! Allis-Chalmers, Milwaukee 1, Wis.

A-3716

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

MODERN MASTERPIECE by U.S. Industry

S.S. United States, New Flagship of American Merchant Marine, Protected by World's Greatest Lubrication Knowledge!

SAILING on her maiden voyage this summer, the 990-ft. S.S. *United States*, largest and fastest liner ever built in America, represents a cross section of U. S. industry . . . a composite of industrial lubrication problems.

Every state contributed to her construction, more than 800 firms supplied materials. Represented are the steel and aluminum industries, metal working, power generation, air conditioning, refrigeration, chemical, textile, plastics, electrical—many others.

Lubrication a Big Problem

The cutaway view shows a small portion of the machinery that powers and operates this world's

Designed by Gibbs & Cox, Inc. Built by Newport News Shipbuilding and Dry Dock Company.

most modern ship. It also indicates why the S.S. *United States* — containing many of the same machines found in plants, mills and mines — presented lubrication problems as complex as any ever encountered in industry.

To solve these problems — to protect giant steam turbines, intricate hydraulic systems, generators, compressors, precision instruments and controls — United States Lines called on Socony-Vacuum.

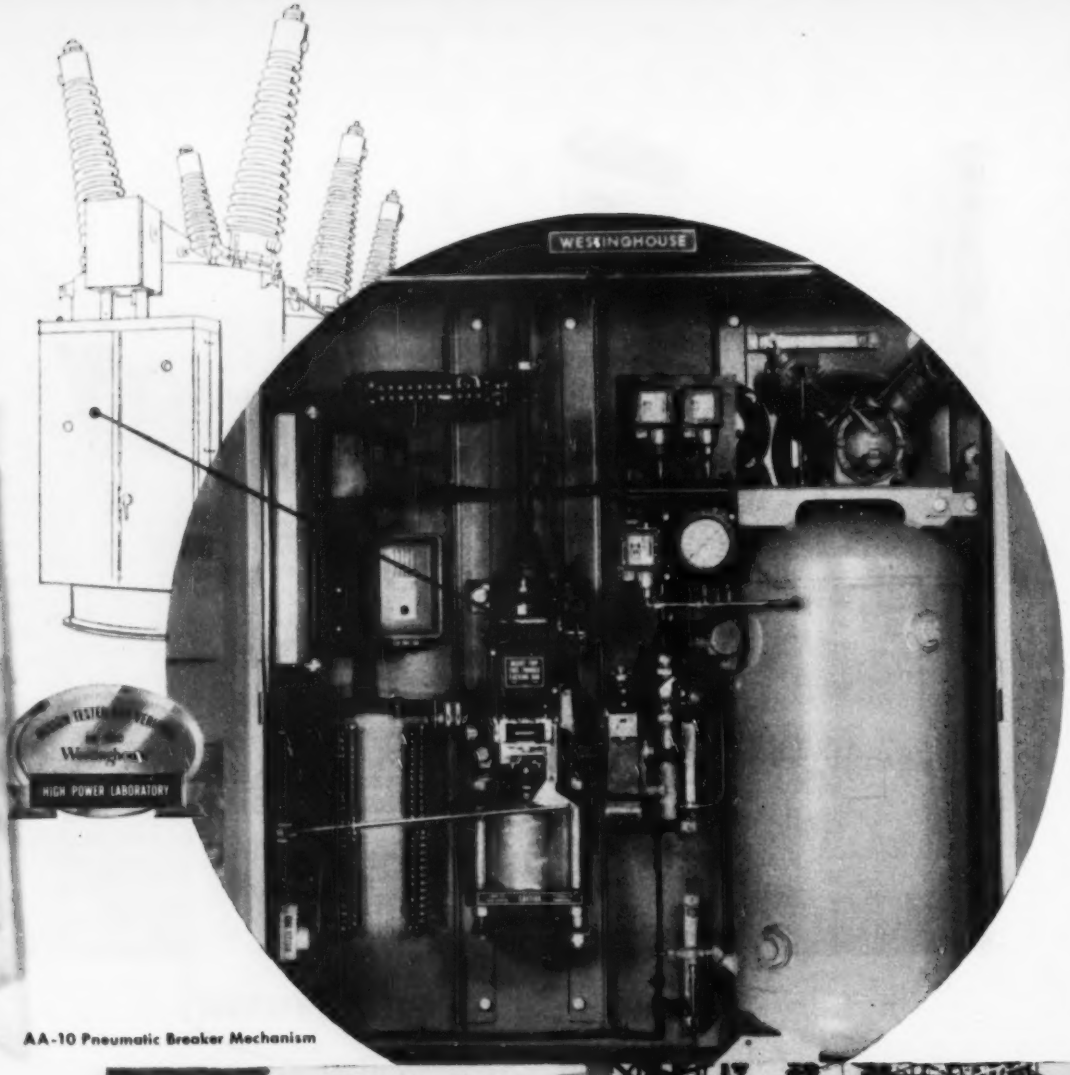
Today, the S.S. *United States* is protected stem to stern by a complete program of Correct Lubrication. This same unsurpassed protection is available to *you*. Why accept anything less?

SOCONY-VACUUM

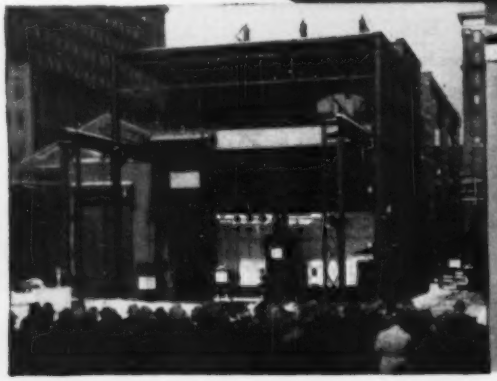
Socony-Vacuum

Correct Lubrication

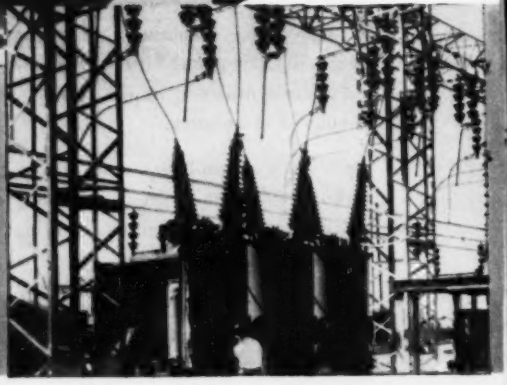
SOCONY-VACUUM OIL COMPANY, INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION



AA-10 Pneumatic Breaker Mechanism



These breaker mechanisms, like every advance in Westinghouse apparatus design, have been proved in exhaustive tests in the Westinghouse High Power Laboratory.



This 10,000,000-kva, 161-kv, 3-cycle breaker is equipped with an AA-10 pneumatic mechanism, and arranged for 20-30-30 cycle multiple reclosing.

New Breaker Operating Mechanisms Combine High Speed Reclosing...and Mechanically Trip-Free Opening

Two pneumatic operating mechanisms—the AA-7 and AA-10—now handle the complete range of Westinghouse Oil Circuit Breakers, from 15 kv, 500,000 kva to 230 kv, 15,000,000 kva. They provide new standards of operation.

THE AA-10 MECHANISM IS . . .

Larger . . . more powerful to meet the closing requirements of today's highest rated breakers.

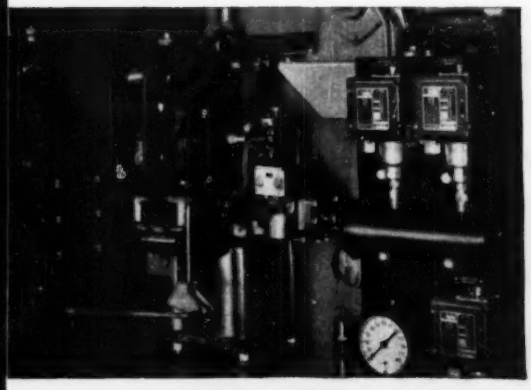
Selective . . . It trips mechanically trip-free whenever there is high-pressure air in the closing cylinder . . . contacts open unrestrained . . . never a drag from the closing piston. For high-speed reclosing, the mechanism trips non-trip-free . . . opens only part way and quickly recloses, greatly reducing stress on both the mechanism and breaker.

Unlimited Reclosing Possibilities . . . High-speed reclosing in 20 cycles, or . . . ultra-high-speed reclosing in 15 cycles or less, or . . . multiple high-speed reclosures.

THE AA-7 MECHANISM . . . Mechanically trip-free for all operations . . . meets the closing requirements of moderately loaded breakers and provides 20-cycle reclosing even after mechanically trip-free opening.

Proved Operation

Exhaustive tests in the Westinghouse High Power Laboratory and field experience on the largest breakers in service today are your assurance of perfect mechanism performance. For complete details, ask for Bulletin DB 33-125. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.



The AA-7 mechanism, like the AA-10, features roller-bearing latches, no adjustments, simplified air control, unrestricted access to all components.

See "Electrical Proving Ground"

The dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details see your Westinghouse representative, or write Westinghouse Film Division, P. O. Box 868, Pittsburgh 30, Pa. J-60782

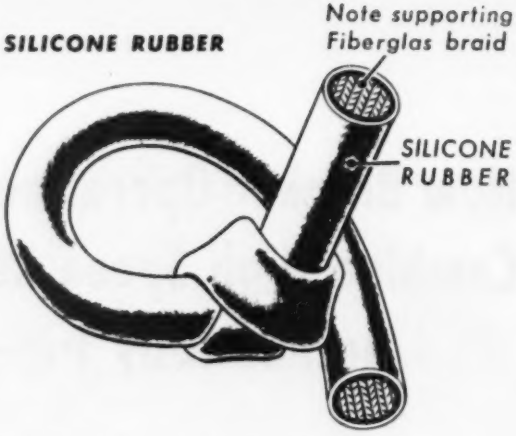
ELECTRICAL PROVING GROUND

YOU CAN BE SURE... IF IT'S Westinghouse

POWER CIRCUIT BREAKERS

NOW . . . FIBERGLAS *plus* SILICONE RUBBER

BH "1151"



. . . for longer electrical equipment life

BH "1151" is a new electrical sleeving that provides the unique combination of permanent flexibility and high dielectric strength at Class "H" temperatures. It offers a long-lasting union of two great inorganic materials — Fiberglas and Silicone Rubber.

BH "1151" shows no change in physical or dielectric properties after 15 minutes at 600°F.; 4 hours at 500°F.; or 96 hours at 450°F. It is applicable for continuous operation through a temperature range of –90°F. to 400°F.

BH "1151" can be twisted, knotted or bent without crazing, cracking, or loss of dielectric strength. Available in rated grades up to 7,000 volts. Electrical resistance is unusually high. It will not support fungus growth. Offers excellent chemical resistance. Meets all applicable NEMA specifications for Class H insulations.

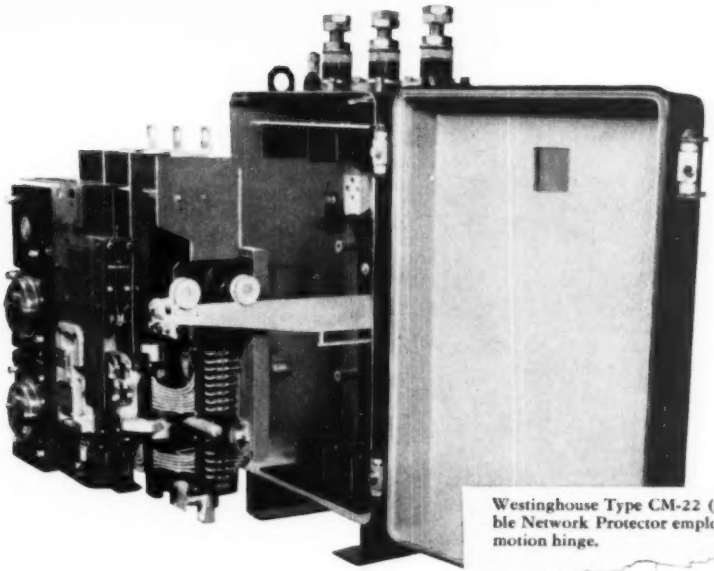
BH "1151" is available in colors, for circuit tracing and coding, in continuous coils, 36 inch lengths, or in short lengths cut to individual specifications. It is made in Grades H-A-1, H-B-1, H-C-1 and H-C-2. Get all the facts on this superior electrical insulation — write for data sheets today.

Address Dept. W-7

Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2383530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.



Westinghouse Type CM-22 (above) submersible Network Protector employs the new dual-motion hinge.

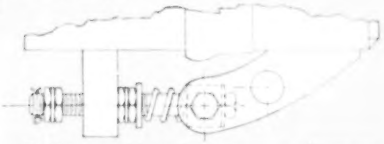
NEW, dual-motion hinge

SIMPLIFIES CLOSING OF NETWORK HOUSING

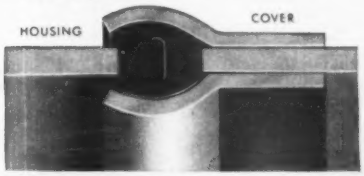
Now, the exclusive Westinghouse quick-opening, submersible Network Protector housing—which eliminated 26 to 44 bolts—has been further improved to simplify the operator's job. A new dual-motion hinge permits the cover to ride forward before it is swung open. This action relieves gasket pressure... leaves no restraining force to work against when closing the cover.

Your operators will like the simplicity and convenience of this Westinghouse "plus," as well as other housing features such as captive hardware, factory-adjusted stop nuts, and provision for hinging on either side. You'll like many additional, exclusive features built into all Network Protectors. For complete information, contact your Westinghouse Representative or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

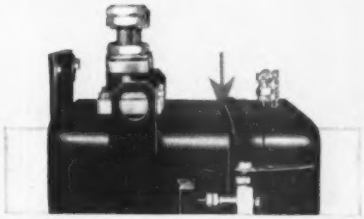
J-60790



Dual-motion hinge detail. Factory adjustment for centering cover is independent of adjustment for gasket deflection.



Tubular Neoprene gasket compressed between machined edges on housing and cover provides a tight seal.



Top of network housing showing uniform gap between housing and gasket before tightening cover. This prevents the hinge side of the cover from "rolling" the gasket.

YOU CAN BE SURE... IF IT'S

Westinghouse

NETWORK PROTECTORS

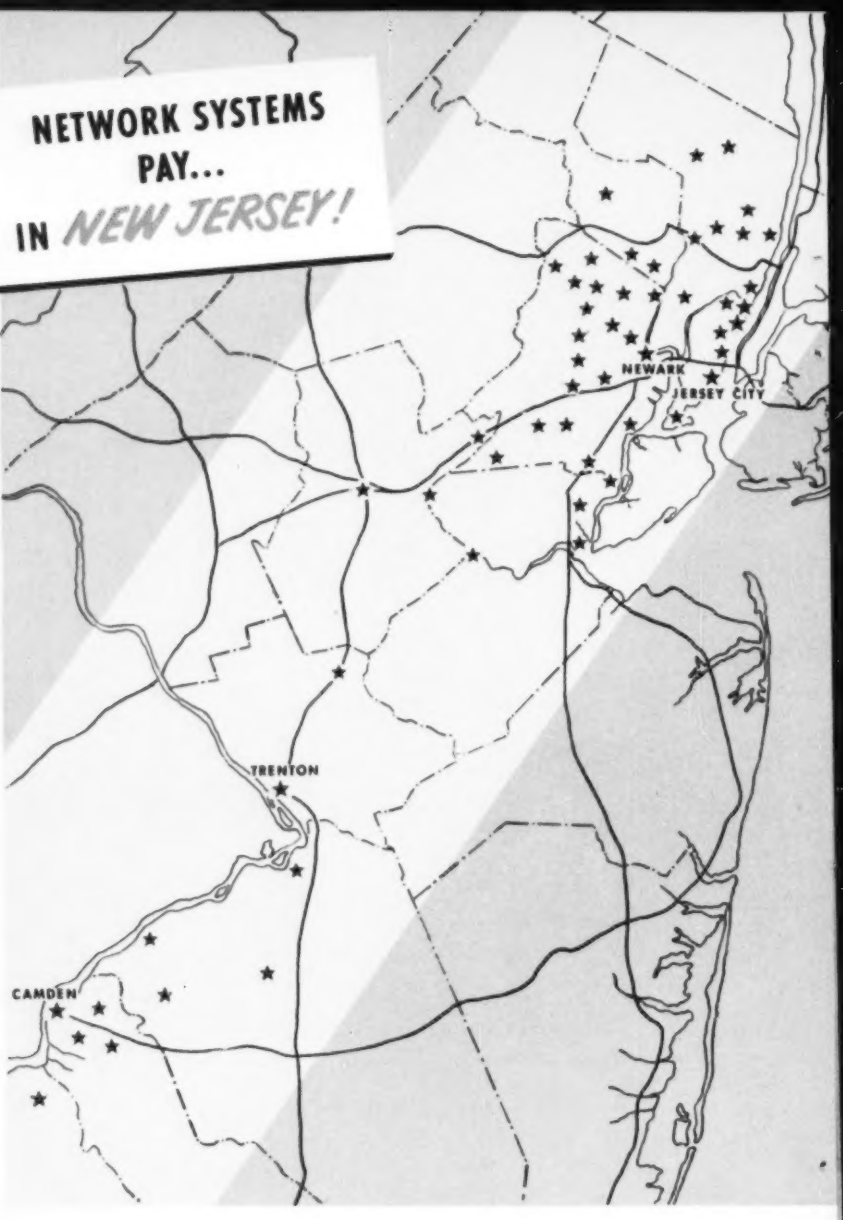
NETWORK SYSTEMS PAY... IN *NEW JERSEY!*

Newark, Underground Network

Clifton, Underground and Overhead

East Orange, Underground Network

Princeton, Underground Network



Trenton, Underground Network

Teaneck, Underground Network

Union City, Underground and Overhead

Moorestown, Underground Network

Advance Planning at its BEST!

Most interesting fact about this largest single utility group of networks is the unmistakable evidence that farsighted planning paid! For this alert utility took bold preventive action more than 20 years ago. And when peak loads had doubled, Public Service Electric & Gas Company of New Jersey was really ready!

Public Service serves 1,234,287 consumers in progressive and fast-growing New Jersey. It was among the first to recognize the long-range merits of the A-C Secondary Network System. Beginning in 1928, with its first network in Newark, Public Service had 5 in operation by 1930. By 1940, the number of networks had swelled to 90. Today this utility has a total of 94 networks . . . underground, overhead, and spot . . . serving a wide variety of load requirements in fifty-six communities . . . ranging in size from 4,189 to 438,776 . . . throughout this important industrial belt. The views on these pages show typical communities so served.

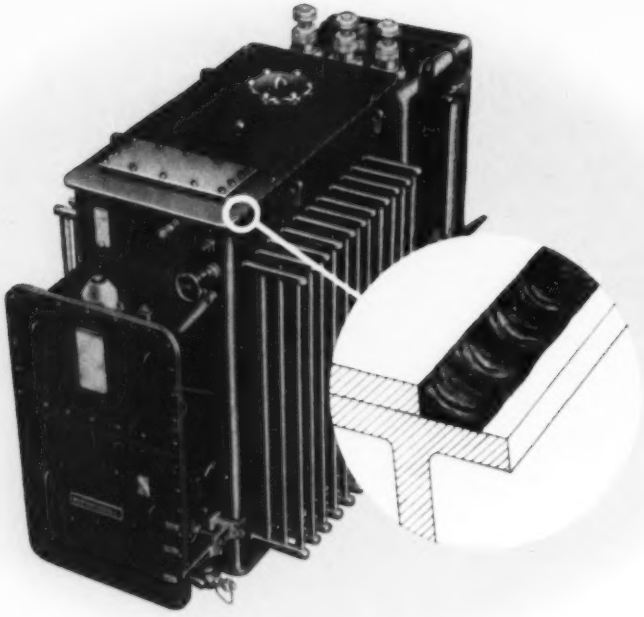
Because of intelligent advance planning, the tremendous expansion of the war and postwar years, which practically doubled peak loads throughout this network area, presented no problems! The unusual flexibility of the A-C Secondary Network System enabled Public Service to offer high standards of service continuity to small communities as well as large ones. The Network System can provide unusually high service continuity for your customers and reduce power distribution costs too! Investigate all of the economic advantages of the A-C Secondary Network System . . . now is the time to prepare for tomorrow's expanding loads. Call or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-97159

Westfield, Underground Network

Our Lady of Lourdes Hospital, Camden, Underground Spot Network

YOU CAN BE SURE...IF IT'S Westinghouse

NETWORK EQUIPMENT



NO COVER BOLTS! NO GASKET!

Another Maintenance Problem Reduced!

It's a major maintenance problem when oil sludges and insulation oxidizes.

Leakage of air and moisture is most likely to occur through the main cover gasket. That's why Westinghouse recommends welded-on covers for network transformers. Leaks are prevented . . . uncontrolled breathing eliminated.

It is still necessary, however, to gasket some switch and terminal chamber covers, bushings, oil gauges and handhole covers. Cortite* gaskets, composed of cork particles individually surrounded and bonded in special synthetic material, have been developed for this purpose. They provide a long-lasting, seepage-proof seal.

These two features, welded-on covers and improved gasketing for small openings, serve to greatly lessen the possibility of oil sludging and oxidation of insulation.

Removal and replacement of welded covers, if necessary, is easier and quicker than the gasket-and-bolt technique. For proof, ask your Westinghouse representative to arrange a showing of the ten-minute movie, "Welded-on". All operating and maintenance supervisors should see it. Phone today or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE SURE...IF IT'S

Westinghouse

NETWORK TRANSFORMERS

*Trademark

3-70622

Test after Test

has proved the PENN-TAP'S

Unequalled Strength

No other fitting of this type has matched the Penn-Tap in tensile strength, in numerous tests to destruction. The reason is obvious:

The Penn-Tap is more sturdily constructed . . . exceptionally tough silicon bronze alloy and *more of it* (at no added cost).

For taps, service entrance connections, dead ends . . . indoor or out. Quickly installed with ordinary wrench.

ONE PIECE—no loose parts . . . swivels on one locked bolt. Holds tight permanently. 7 sizes, for cables 10 Str. to 1,000 MCM.

Only one other Split Bolt Connector can take as high clamping pressures as PENN-UNION

Hundreds of competitive torque tests, of Penn-Union Split Bolt Connectors against other fittings of this type, have shown:

The Penn-Union Connector is *definitely stronger than all others except one, which closely follows Penn-Union design and is nearly equal.*

Excepting this one similar fitting, the Penn-Union Connector withstands clamping pressures 15% to 55% higher.

MAKE THESE TESTS YOURSELF. We will gladly furnish sample Penn-Union Connectors for tests against any other make. *Just tell us the sizes you are using.*

Sold by Leading Wholesalers

PENN-UNION ELECTRIC CORPORATION • ERIE, PA.

Canada: Dominion Cutout Company, Ltd., 250 Richmond Street, West, Toronto

The *Complete* LINE of CONDUCTOR FITTINGS

PENN-UNION

KEARNEY
SQUEEZON

The Cold Welder Connector for Today's Increased Loads

Advantages

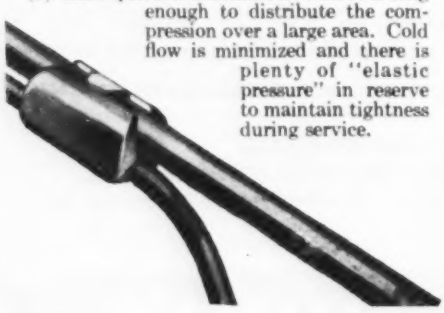
1. INEXPENSIVE
2. PERMANENT—EASY TO USE
3. UNIFORM TIGHTNESS
4. NO CONTACT OXIDATION
5. EXTRA HIGH CONTACT PRESSURE

THE KEARNEY SQUEEZON is a highly efficient connector for use with aluminum wire or combinations of aluminum and copper wire. It is the only connector in the field which satisfies *all* the mechanical and electrical requirements for use with aluminum.

(1) The Squeezon prevents the formation of aluminum oxide by permanently sealing out the air from between contact surfaces. No air . . . no oxidation . . . higher conductivity. It's as simple as that.

(2) Aluminum and copper stand 1.85 volts apart in the Electro Chemical Series. That's why the Squeezon for aluminum is plated. The plating prevents galvanic action and at the same time provides excellent current transfer surface through the connection.

(3) The Squeezon is formed so that it is long enough to distribute the compression over a large area. Cold flow is minimized and there is plenty of "elastic pressure" in reserve to maintain tightness during service.



THE KEARNEY SQUEEZON for aluminum is a plated pure copper compression type connector forged in a shape having an "H" cross-section. The connection is made by placing one conductor in the top half of the "H" and the other in the bottom. The sides are then coined over under tremendous hydraulic pressure—applied by pumping one handle of the Squeezon Tool. When the second distinct click is heard, the connection is then complete, permanent and a perfect electrical bond.

Each conductor slips into a rounded trough or bed in the connector. After tremendous hydraulic pressure is applied, the Squeezon is compressed so that all air is permanently excluded from between points of contact.

Because corrosion of these critical surfaces cannot occur, conductivity is extremely high. Result: the temperature of the connection is kept well below the temperature of the line wire. You can count on permanent, trouble-free connections designed to carry the full rated load of the wire.

Check # 1 on the coupon for complete information.

The Mark of KEARNEY *Quality Products*

KEARNEY PRODUCTS for

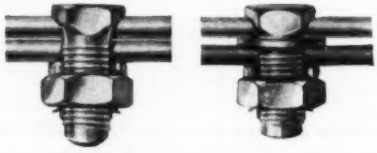
KEARNEY PRODUCTS — *Give a Little More for a Little Less thru Engineering* —

KEARNEY

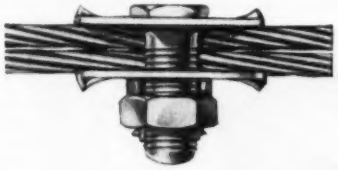
CON-NEC-TITES—*for all Types of Connections*

KEARNEY split bolt connectors for aluminum are made of plated, high conductivity Kearnalloy. This specially developed material combines toughness for mechanical strength with a degree of hardness which will not damage or nick line wires. Aluminum wire, more so than copper, requires a connector which will cushion against it and yet withstand high wrench torque.

All Con-Nec-Tite edges are carefully rounded, threads are clean and well defined and thread crests are dulled to eliminate burrs and wire edges.

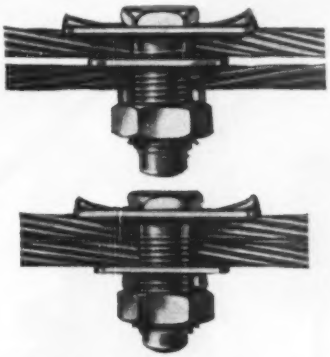


Completely plated Con-Nec-Tites are available with or without fully plated washers for use as "universal connectors." Plated washers prevent electrolytic action in bi-metallic taps. Washers should also be used to better accommodate smaller tap off wires or leads.



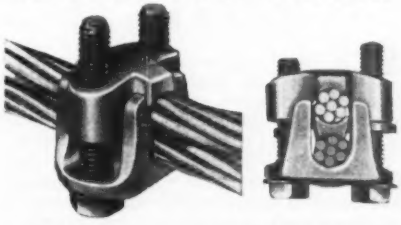
There are special Con-Nec-Tites for aluminum to aluminum connections. Two large, bell mouth aluminum washers maintain high pressure contact and at the same time act as vibration dampers on the conductor. The washers also greatly increase the contact area through the connection.

Mark # 2 on the coupon for prices and complete listing.



Con-Nec-Tites with bell mouth washers place larger areas under compression. Upper washer is aluminum; lower side of middle washer and "V" groove of lower washer have copper surfaces. Aluminum to aluminum connections are made by dropping the middle washer down over lower washer.

PRESSURITE CLAMP



Here is a compact two-bolt clamp for permanent high pressure taps on copper or aluminum conductor in sizes 1/0 to 1033.5 MCM ACSR. Made of high strength bronze, it accommodates two maximum size cables or one maximum and any smaller size wire to a minimum of No. 8 AWG solid. (Tap wire minimum size will be larger if a spacer is required.)

Check # 3 for catalog information on the Pressurite Clamp.

Designed and Manufactured by **JAMES R. KEARNEY CORPORATION**
4236 CLAYTON AVE., ST. LOUIS 10, MO.

ALUMINUM CONDUCTORS

KEARNEY PRODUCTS — *for Better Construction — Safer Maintenance* —

Better Connections are made on Clean Conductors

KEARNEY

CLEANING BRUSH

ALUMINUM oxidizes readily upon exposure to air. This high resistance corrosion fortunately is limited to a thin, invisible layer, but it is highly important to remove it before making any kind of an electrical connection.

Abrasion is by far the best method for cleaning aluminum conductor. Kearney engineers have designed a wire brush which will scuff up and remove all corrosion without damage to the conductor and do it in a very few short strokes. The replaceable, adjustable brush elements form a "V" which accommodates any wire size easily.

Brushes are available with rugged metal handles for use with gloves on distribution circuits, or for higher voltage they can be ordered with fit-on attachments for hot stick use.

Mark # 4 for more information on conductor cleaning.

Seal Out Oxidation the Modern Way

KEARNEY

AIRSEAL

Prevents galvanic action in bi-metallic taps

CONNECTIONS on aluminum wire, as well as on copper, must be protected against corrosion. Even though thoroughly clean when connected, oxidation quickly forms on unprotected surfaces. Result: a trouble-making, high resistance tap.

Kearney Airseal is a pliable, high dielectric compound which is chemically inert. It is the most nearly perfect material in the field today for sealing out moisture, oxidation and corrosion.

Airseal is applied by kneading it over the connector to be protected where it forms a coating impervious to moisture and contaminated atmospheres. It is much more effective than electrician's tape.

An "X" by # 5 brings you samples and more details.

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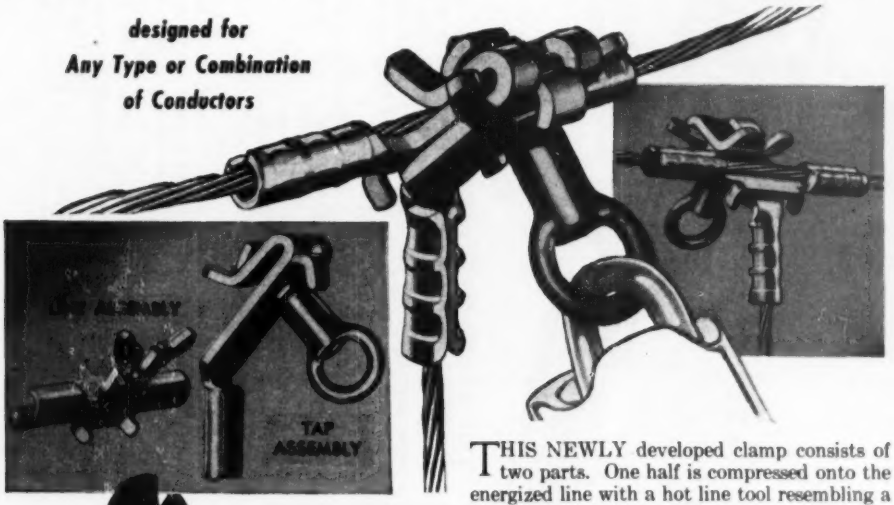
KEARNEY PRODUCTS — *Give a Little More for a Little Less thru Engineering* —

for Making Permanent, High Conductivity Taps . . . Use

KEARNEY SQUEEZ-TAP CLAMP

designed for Any Type or Combination of Conductors



THIS NEWLY developed clamp consists of two parts. One half is compressed onto the energized line with a hot line tool resembling a bolt cutter; the other is compressed onto the tap wire. The clamp fits snuggly in the jaws of the tool so that there is no fumbling in positioning it on the line before compression. The two parts are then joined quickly together and locked with the large eye using a standard clampstick as shown. Current is transferred through the clamp by heavy, wide contact surfaces. Conductor pitting is absolutely eliminated because any arcing experienced in disconnecting the tap will occur between clamp halves and not between the clamp and conductor. For this reason the clamp is recommended for installation beyond the armor rods.

Clamps are made of aluminum and are designed for use with any type or combination of conductors. Those for use with copper or Copperweld have a copper coating on the appropriate contact surfaces.

Both line and tap assemblies are available for wire sizes 4/0 ACSR maximum to 6 solid aluminum minimum. All size line and tap assemblies are interchangeable and can be purchased separately.

Get more information about this revolutionary design. Check #6 on the coupon.

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ALUMINUM CONDUCTORS

KEARNEY PRODUCTS for

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KEARNEY PRODUCTS — *for Better Construction — Safer Maintenance* —

KEARNEY
WEDGE-TITE CLAMP

A Service Clamp for Bare Neutral, Self-Supporting Cable

THE WEDGE-TITE CLAMP is the ideal way to dead-end the bare neutral, self-supporting type of secondary and service drop cable. It is designed for use either at the house or on the pole. The clamp is easy to install, and more important, easy to adjust if loading of long spans causes increased sag after a period of service.

A self-contained, serrated wedge in the clamp grips the bare neutral with a force proportional to the strain put upon it. This tension on the bare neutral is not transmitted to the insulated conductors, thus preventing insulation creep with its resulting dangers of leakage and shorts.

To install, simply thread the neutral through the clamp and move the wedge against the wire when correct sag is obtained. The bail is then linked through a wireholder as shown or dropped over a standard house or pole hook, and the wires are ready for connection. If adjustment is necessary, tap the wedge with a hammer, move the wire to the correct position and move the wedge back against the wire.

Corrosion resistant materials are used throughout and plated for use with all types of neutral wire. Two sizes are available. The larger accommodates wire sizes 1 0 stranded maximum, through 4 stranded, minimum. The smaller takes 4 stranded through 6 solid.

Check # 8 for more details on the Wedge-Tite Clamp.

KEARNEY
SERVICE CABLE TIE

THE USE OF the new self-supporting, three wire service cable requires a method of securing the insulated wires to the bare neutral so that they do not separate at the dead-end. Tape is not satisfactory because vibration of long spans causes it to fray and lose its grip on the three wires.

Kearney engineers have developed a simple aluminum tie which does the job neatly and permanently. It is installed with the fingers just in front of the dead-end clamp and is designed or use with any type of bare neutral, solid or stranded. Will not damage insulation.

Mark # 7 for prices and sample of this time saver.

KEARNEY PRODUCTS — *Give a Little More for a Little Less thru Engineering* —

KEARNEY
CON-NEC-TAP CLAMPS

***For Trouble Free Taps... Specify* KEARNEY**

Kearney clamps and stirrups cover a wide range of conductor sizes from 8 ACSR to 1,431 MCM ACSR. In general, clamps may be of the protected thread type (pictured below) or may have weather resistant Everdur bronze operating screws. In either case the tightening torque is transmitted to the jaws with high efficiency and without danger of distortion. This feature assures you of permanent high pressure contact. Stirrups, designed to protect the line from pitting in event of arcs, are either the spring type or the protected thread type.

THERE is a complete line of Kearney live-line clamps for use on aluminum to aluminum taps and a separate series for use on aluminum to copper connections. The first features bodies and jaws precision fabricated from a special heat treated aluminum alloy while the second uses heavy zinc plated bronze for these parts.

All Kearney clamps are perfectly balanced so that eye screws remain in the correct position for tightening on the line. Larger screws and jumper lugs are a guarantee that the clamps are vibration proof and will remain tight on the conductor and jumper.

Long top lip balances clamp for easy installation.

Kearney Protected Thread clamps insure ease of removal regardless of the length of service on the line. The screw operates in a fully enclosed, grease filled chamber. This feature prevents all corrosion of the threads and eliminates any possibility of having to cut the clamp from the conductor. All contacts are well rounded and smooth. A strong spring lock washer compensates for any expansion or contraction of clamp or conductor.

Get the whole story of Kearney Hot Line Clamps. Mark #9

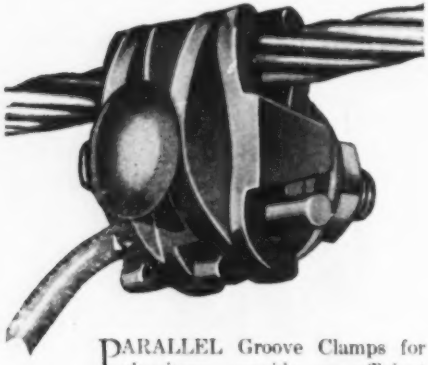
Designed and Manufactured by **JAMES R. KEARNEY CORPORATION**
4236 CLAYTON AVE., ST. LOUIS 10, MO.

ALUMINUM CONDUCTORS

for Making Better Tap-Offs From Larger Cables

Install

KEARNEY
PARALLEL GROOVE CLAMPS

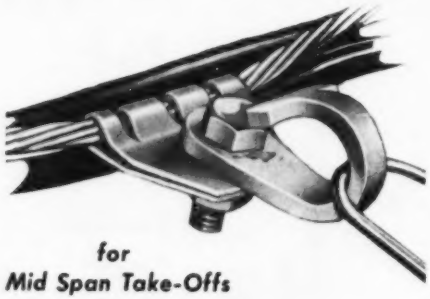


PARALLEL Groove Clamps for aluminum provide an efficient means of tapping larger size cables. Cast of bronze, they are heavily plated for use with any conductor combination.

Two high strength clamping members are secured with one, two or three heavy steel bolts, depending on size of clamp. These bolts are readily tightened with a single wrench. The tightening force is evenly distributed over a wide area on the conductors for permanent, high pressure contact without damage to the wire.

There are two types of clamps—adjustable and non-adjustable. The adjustable model is made in 5 sizes: the smallest fits a range of 6 solid aluminum to 1 0 ACSR, and the largest, 266 to 666 MCM ACSR. The non-adjustable series consists of approximately 50 clamps designed for a specific line and tap size. The smallest is 2 0 ACSR run and 4 solid tap; the largest, 874 MCM run and 874 MCM ACSR tap.

Check #10 for complete catalog information on the entire series.



for Mid Span Take-Offs Use

KEARNEY
SPAN CLAMPS

A NEW TYPE of construction calls for the use of bare neutral, self-supporting cable for secondaries as well as service drops. Lighter weight of the three wire cable permits increased span lengths. Because of these longer spans it is sometimes impossible to run service wires to a pole for connection. Kearney has developed a clamp specifically for mid-span take-offs.

To install, simply slip the span clamp onto the secondary neutral and tighten the single bolt. Position a Wedge-Tite Clamp on the service cable and drop the bail over the span clamp. Next, connect the wires with Squeezons, cover with Airseal and bind the cable with Service Cable Ties in order to prevent separation.

A typical mid-span installation uses the following Kearney products:

If you use this type of construction, Check #11

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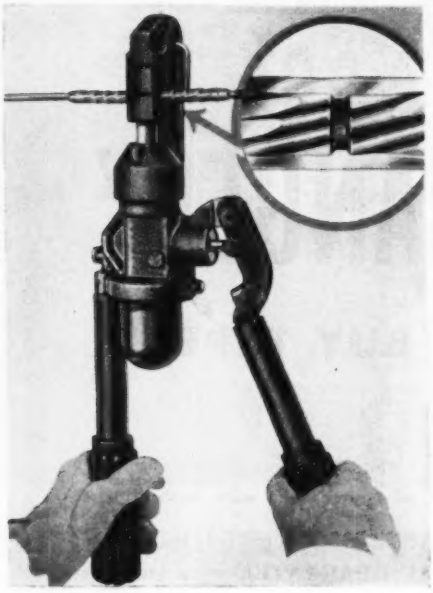
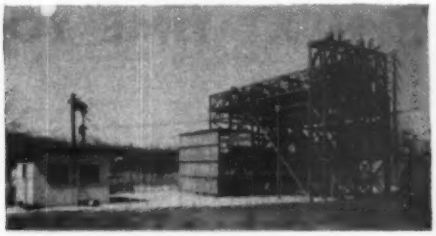


KEARNEY PRODUCTS ARE FIELD TESTED

ALL KEARNEY PRODUCTS *are field tested under the conditions found only in actual operation. Our facilities now include an ultra modern laboratory substation located on the outskirts of St. Louis where 10,000 amperes at 15,000 volts are available for very exacting tests. That's one reason why we say, "Specify Kearney for Safer Maintenance . . . Through Constant Field Research and Engineering."*



The Kearney 34.5 KV Substation

for Permanent, High Conductivity Connections

KEARNEY SPLICING SLEEVES

KEARNEY sleeves for aluminum are now designed for use with the Squeezon compression tool. Ten tons of pressure are used to "cold weld" the conductors to the sleeve forming a joint higher in conductivity than the wire itself.

Special dies in the tool distribute the pressure over the proper area in order to prevent distortion of the conductor. Cold flow is controlled by the dies so that metal is massed in the correct position to prevent pull-out. Sleeves are made of a special aluminum alloy which is plastic under high pressure but will not relax after compression.

Check #12 for the important details on the new sleeves.

Check the Kearney Products that will help you on the coupon below . . Mail Today

Gentlemen:

Send me more information about the items I've checked below.

1 Squeezon Connector	7 Service Cable Tie
2 Con-nec-tites	8 Wedge-Tite Clamps
3 Pressurite Clamps	9 Con-nec-tap Clamps
4 Cleaning Brush	10 Parallel Groove Clamps
5 Airseal	11 Span Clamp
6 Squeez-Tap Clamps	12 Splicing Sleeves

Name ..... Title .....

Company .....

Address .....

Designed and Manufactured by **JAMES R. KEARNEY CORPORATION**
4236 CLAYTON AVE., ST. LOUIS 10, MO.

ALUMINUM CONDUCTORS

How to be Sure You Don't get "SHORT-CHANGED"

...NEXT TIME YOU BUY TAPE!

While minimum length can be depended on to be accurate in any roll of tape, it's the *weight* of the roll that you must watch. It is important for you to know: Does the No. 4 Roll actually weigh 4 ounces, as it should; and the No. 8 Roll 8 ounces?

For weight reveals whether tape is full strength in substance, or whether its protective and adhesive properties have been weakened due to skimpy materials. Underweight tape means you must use more of it, and take the extra time to roll more on, when a job requires maximum tape protection.

You can always weigh every roll you buy, of course, but why bother, when HAARTZ-MASON publicly makes you a DUAL GUARANTEE — a guarantee covering both weight and length, and prints this information boldly on every roll and container.

So get full measure the next time you buy tape by accepting none but the DUAL GUARANTEED HAARTZ-MASON brands.

Haartz-Mason, Inc.
WATERTOWN 72, MASSACHUSETTS

Note: Weight and length information are printed boldly on every roll and container.

LET'S LOOK AT THE FACTS

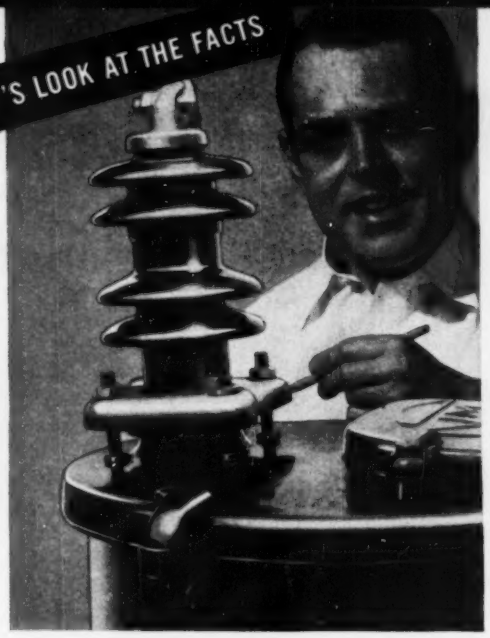


FIGURE 1. Cover bushings on an L-M Round-Wound 15 kva 7200 volt transformer. Note the generous width of skirting for high creepage distance, the four-bolt cover clamp that assures even pressure on gasket and porcelain.

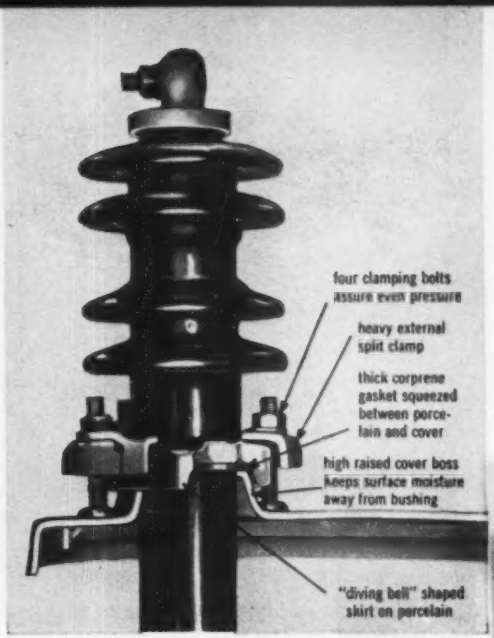

four clamping bolts assure even pressure
heavy external split clamp
thick corprene gasket squeezed between porcelain and cover
high raised cover boss keeps surface moisture away from bushing
"diving bell" shaped skirt on porcelain

FIGURE 2. Close-up of triple-seal against moisture. 1. Deep-skirted porcelain gives "diving bell" effect. 2. Thick corprene gasket, squeezed between porcelain and steel boss. 3. Deep-drawn cover boss keeps moisture away.

Cover Bushings on L-M Round-Wound Transformers Triple-Protected Against Moisture, Corona

"Diving Bell" design porcelain, thick corprene gasket, and high raised boss on cover provide triple barrier

By **ALVIN B. COYLE,**
Manager Transformer Sales
Line Material Company

In the design of cover bushings, L-M engineers have gone to great lengths to eliminate moisture entrance and corona, which would cause undesirable radio interference.

The porcelain itself is designed with exceptionally generous creepage distance and high wet-flashover characteristics. The best grades of electrical porcelain are used, with the surface fully glazed. At the bottom is an extra skirt or lip, which is curved downward to give a "diving bell" effect in keeping moisture away from the gasket.

The porcelain is mounted on an exceptionally high raised boss in the cover, which in itself leads moisture away from the bushing. Between the boss and the porcelain is a thick corprene gasket tightly squeezed by the four-bolt cover clamp. Corprene has the initial hermetic sealing property of synthetic rubber plus the elasticity and non-flowing characteristics of cork to maintain a permanent vapor-proof seal.

The result is a bushing that provides exceptional protection against moisture and breathing; it is corona-free and causes no radio interference.

Get Full Information

These cover bushings are standard equipment on all L-M Round-Wound transformers of 5000 volts and over. For more information on these and other features of these outstanding distribution transformers, ask the L-M Field Engineer; or write Mr. Coyle at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

"Round-Wound" is a Line Material Company trademark.

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LM ORTO

LET'S LOOK AT THE FACTS

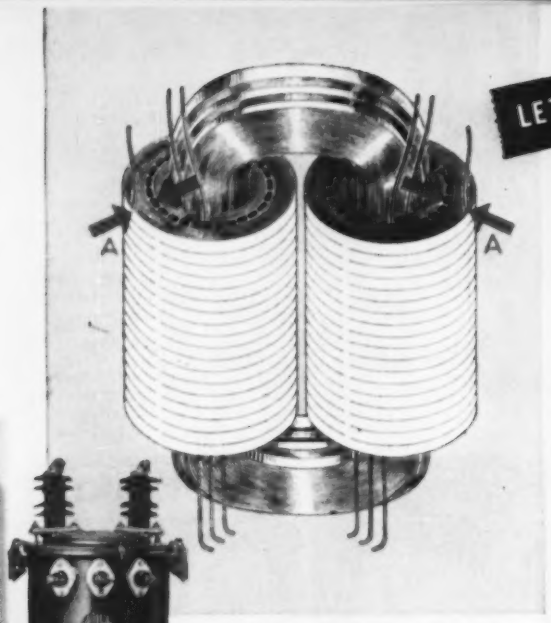

FIGURE 1. In Round-Wound transformers, primary windings are on the outside of the coils, providing ample creepage distance between high voltage leads and low voltage windings. Note the greater creepage distance "A" in this Round-Wound coil than "A" in the shell type construction shown in Figure 2.

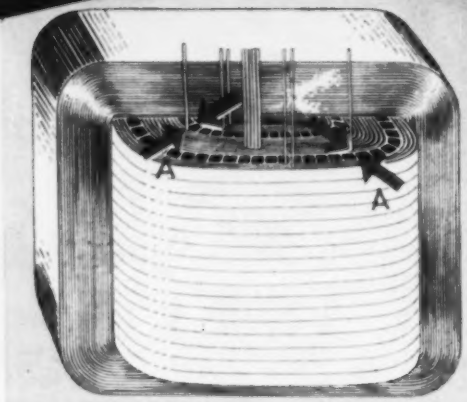

FIGURE 2. In the shell type of transformer, where the primary winding must be sandwiched between secondary windings, and are confined by core steel, primary leads are much closer to the secondary, resulting in far greater danger of flashover. Danger points are the short creepage distances "A" between the high voltage leads and the low voltage windings.

How L-M Round-Wound Design Provides Higher Impulse Level, Higher Short Circuit Strength

by **EARL J. KIRSCH**, Assistant Manager, Transformer Sales, Line Material Company

Both high impulse level and high short circuit strength are desirable characteristics in distribution transformers. A high impulse level will enable a transformer to resist lightning and switching surges of considerable magnitude. Short circuit strength will enable the transformer to withstand the great mechanical forces created by heavy short circuit currents.

High Impulse Level

Principal factors in attaining high impulse levels are the insulation between winding layers and the creepage distances between leads, windings, and frame. Lightning surges attempt to flash over or through insulation to the ground.

A particularly weak point in many transformers occurs across the end-coil surfaces where leads are brought out of the coils. As shown in Figure 1, it is a characteristic of the Round-Wound type of design that there is substantially more clearance between leads than is obtained with the one-coil shell type shown in Figure 2, where primary winding is often sandwiched between two layers of secondary, and more closely confined by core steel.

Core Versus Shell Type

In the L-M Round-Wound transformer, all of the primary winding is on the outside of the secondary winding. Leads are taken from the outside layer of the primary winding to the primary bushing, providing maximum creepage and flashover distances (Figure 1). In the shell type (Fig. 2), the designer must sandwich the primary winding between two layers of secondary to gain minimum acceptable clearance between the high voltage primary and the core, and to hold the impedance within acceptable limits.

Another problem is that surges tend to "pile up" on the end-turns nearest the bushing—which is why so large a percentage of burnouts occur at this point. Because of the design of the Round-Wound transformer, there is maximum separation of primary windings from ground, and maximum insulation between high and low voltage windings and between coils.

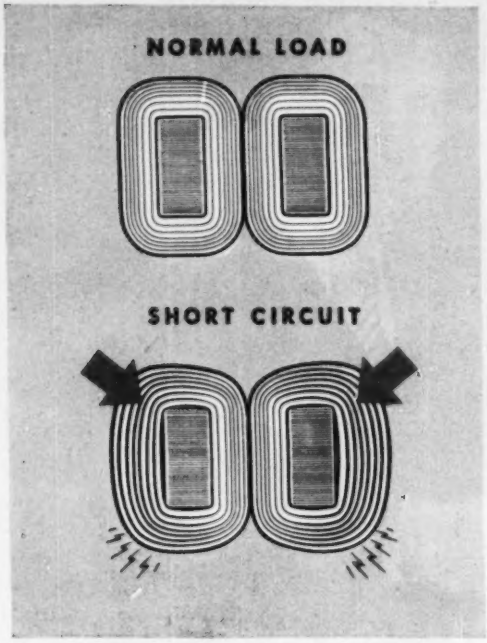

FIGURE 3. Under short circuit currents, rectangular coils tend to distort to a round shape. The forces may be violent enough to damage insulation or even cause complete failure of the coil.

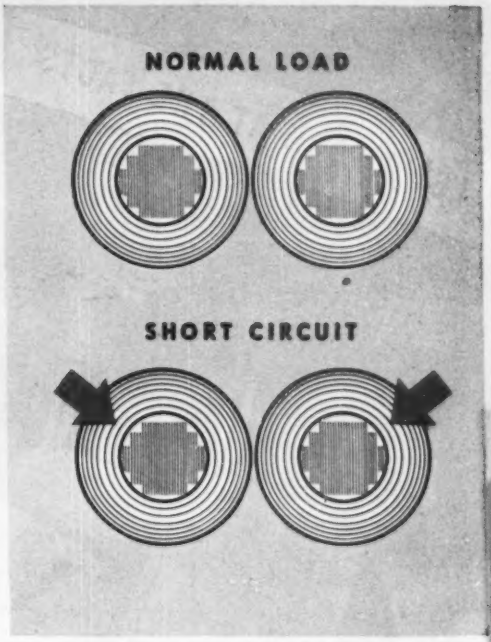

FIGURE 4. Since the coils on Round-Wound transformers are already round, short circuit currents produce very little distortion. Thus "Round-Wounds" have appreciably higher short circuit strength.

The fact that the Round-Wound coils are *round* means that they have not been malleted into a rectangular shape; there are no sharp corners and weak spots caused by damage to the insulation from malleting.

Basic design, plus generous insulation, assures the exceptionally high impulse strength of Round-Wound transformers that is proved not only in laboratory tests but also is borne out by long life performance in actual field service.

Short Circuit Strength

The round coils of the Round-Wound transformer are also a principal factor in the outstanding short circuit strength of this design. As shown in Figure 3, when rectangular coils are short-circuited, the heavy currents tend to force the windings into circular shape. This is very likely to result in damage to the insulation.

But round coils, already circular, are not stressed out of shape, and therefore are not subject to distortion and resulting damage (Figure 4). Thus round coils, plus substantial coil bracing, give Round-Wound transformers inherent advantages in short circuit strength, which contributes materially to their longer life.

Because of their design characteristics, and because of the elimination of variables in production, L-M Round-Wound transformers amply meet NEMA standards with a generous margin of safety.

For Complete Engineering Data

Ask the L-M Field Engineer for the information you want, or write Mr. Kirsch at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

Some Outstanding Characteristics of L-M Round-Wound Transformers

High Short Time Overload Capacity

Better Regulation at all power factors

High Impulse Level, with ample creepage distances and generous insulation

High Short Circuit Strength because round coils have less tendency to distort

Low Exciting Current because the core is not cut or disturbed after annealing

Better Loss Ratios with lower total losses

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Transformers

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"Round-Wound" is a Line Material trademark.

FIGURE 1—Earl J. Kirsch, Assistant Manager, Transformer sales, exhibits the L-M Round-Wound core-coil assembly, which provides an almost ideal magnetic circuit. The wound core has no air gaps; has stable characteristics, low exciting current. Long round coils wound directly onto the core encircle a large part of the core, making possible fewer winding turns and lower copper loss.

FIGURE 2—Core is tightly wound, under tension, of continuous strip of oriented silicon steel, of varying widths to provide a core of nearly round cruciform cross section.

FIGURE 3—The cross section of the wound core is cruciform, closely approximating a round form.

FIGURE 4—After the core is annealed, coils are wound directly on the uncut core, by means of split winding flanges driven by gears on the L-M exclusive winding machine.

How L-M Round-Wound Design Cuts Losses in Distribution Transformers

by **James G. Everhart**, Chief Engineer, Transformer Division, Line Material Company

Utility companies are under terrific pressure today between higher costs and higher taxes on the one hand, and lagging revenues on the other hand. Today, as never before, power must be distributed with the utmost economy, and great attention is being devoted to the reduction of every possible loss.

Transformer losses are one factor that is receiving extensive study, by both the operating companies and the manufacturers.

In this economy drive, transformer loading is also receiving major attention, with a view to maximum utilization of equipment—and this introduces another factor into the study of losses.

The Battle for Savings

The ratio of losses of a distribution transformer affects overload capacity. The copper loss watts vary as the square of the overload. In comparing two transformers of identical physical proportions including coil cooling surface exposed to oil, it is obvious that the unit with higher copper loss has less overload capacity before damaging temperatures are reached than does the transformer with lower copper loss. This effect is further emphasized by the fact the high copper loss dictates a small unit with less surface.

Core loss, on the other hand, is something the utility company pays for 24 hours a day. Therefore the designer must take both core and copper losses into account in providing the best possible balance of performance characteristics.

Exciting current, another factor in operating cost, is deserving of attention, and should be reduced to whatever extent can be done by a design that does not at the same time sacrifice other performance characteristics.

"Balanced Performance"

To meet these considerations, transformer design must essentially be a series of compromises. The L-M Round-Wound transformer consists of a wound core, with long round coils wound directly onto the core (Figure 1). This construction offers certain inherent advantages which make it possible for L-M designers to minimize compromises and offer *balanced performance*.

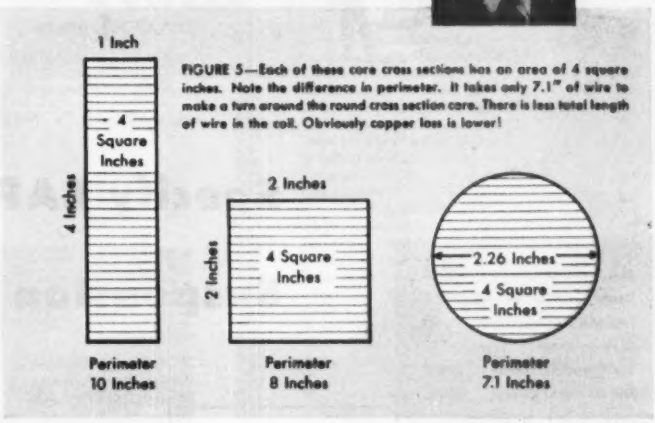

FIGURE 5—Each of these core cross sections has an area of 4 square inches. Note the difference in perimeter. It takes only 7.1" of wire to make a turn around the round cross section core. There is less total length of wire in the coil. Obviously copper loss is lower!

Wound Core Is Not Cut

First of these inherent advantages is the exclusive L-M wound core itself. It is tightly wound of continuous strip of cold rolled oriented silicon steel, with no cuts, laps, or gaps (Figure 2). This superior core makes possible the higher overload capacity and balanced losses of the Round-Wound transformer.

Lower Exciting Current

Since the core is not cut, no air gaps are created which would break up the flux path and produce higher exciting current, with consequent loss in revenue.

Low Core Loss

The higher magnetic efficiency of this core makes it possible to achieve low core loss easily, while the core at the same time contributes greatly to balanced performance. Incidentally, this continuous core is also far more quiet than one which contains air gaps.

Another advantage of the L-M wound core lies in the fact that the cross section is cruciform, approaching the round (Figure 3). Round coils are wound directly onto the core in an L-M designed winding machine (Figure 4). As shown in Figure 5, these coils allow a reduction in the perimeter of the coil and permit more efficient utilization of the copper. With the same cross section wire, and the same number of turns, there is less total length of wire, and less watts of copper loss. This is one of the inherent advantages of the L-M wound core that gives the designer more leeway in achieving a proper balance of performance characteristics.

Detailed typical performance characteristics of Round-Wound transformers are available from the L-M Field Engineer, or by writing Mr. Everhart at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

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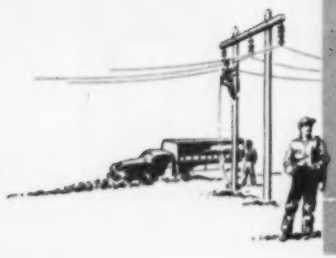

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Impulse Flashover Voltage, Pos. 1.5 x 40	125000
Impulse Flashover Voltage, Neg. 1.5 x 40	125000

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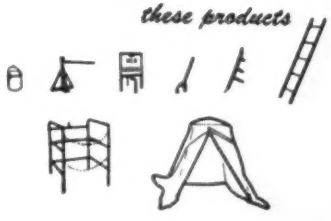
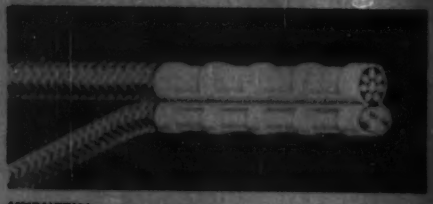


there's a long-standing connection between

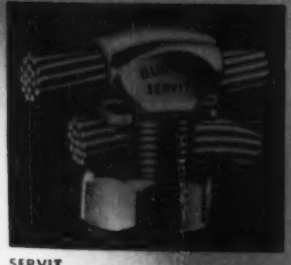
aluminum *and*

in overhead, of course

OKUP



HYBUTTIN



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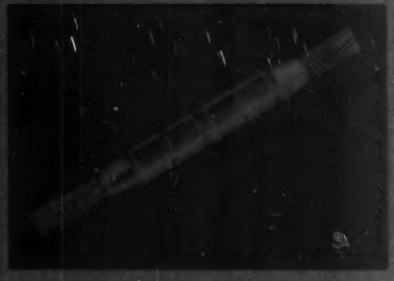

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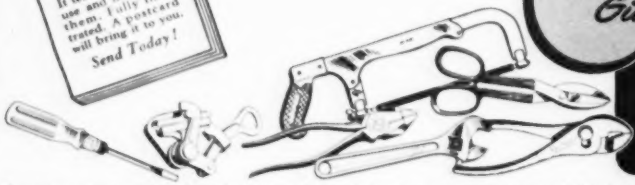

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says JOHN LENHART, Pole Star Tester

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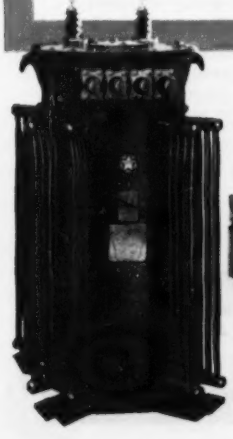
Exciting Current is the current required to magnetize or excite a transformer core. Since exciting current is present in all transformers — under any load or no load conditions — a certain amount of generating Kva must be earmarked for exciting current and for nothing else. In terms of hundreds of transformers, the cost of producing this generating (re-active) Kva can mount up to large amounts of generating capacity supplying nothing but exciting current and returning no revenue to the Utility. It is good business, therefore, to install transformers with low exciting current because real dollar savings can be achieved. Under any load, less generating capacity would be required; at full load, the Utility will derive more revenue-producing output per unit of generating capacity.



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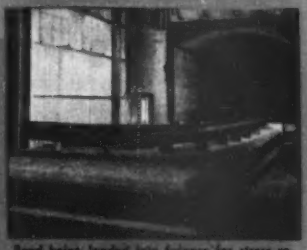
Bending furnace raises pipe temperature to 2000°F in 3 hours, 40 minutes. Thermocouples and pyrometer measure pipe temperature.

Shilled beam completes bend in six minutes. Inside surface temperature dropped about 100°F.



Bend being loaded into furnace for stress relieving. Heat maintained at 1425°F for 4½ hours, then gradually reduced.

Ultrasonic inspection of wall after cleaning of pipe shows maximum thinning in bend of 1/16 inch.

FABRICATION of the main steam line for the Salem Harbor Station of the New England Power Company, vital link in more than 52 miles of piping fabricated by Grinnell, is an example of the *many* skills required of Grinnell piping specialists. Grinnell chemists, metallurgists, physicists, radiologists and supersonic electronic scientists... *all* played a part in the bending, welding and testing operations.

The integration of complex, highly technical skills like these into a *single* organization of trained specialists explains Grinnell's leadership in the field of prefabrication. It explains, too, why your interests are best served when you call upon Grinnell's expert personnel and specialized facilities in the solution of your piping problems.

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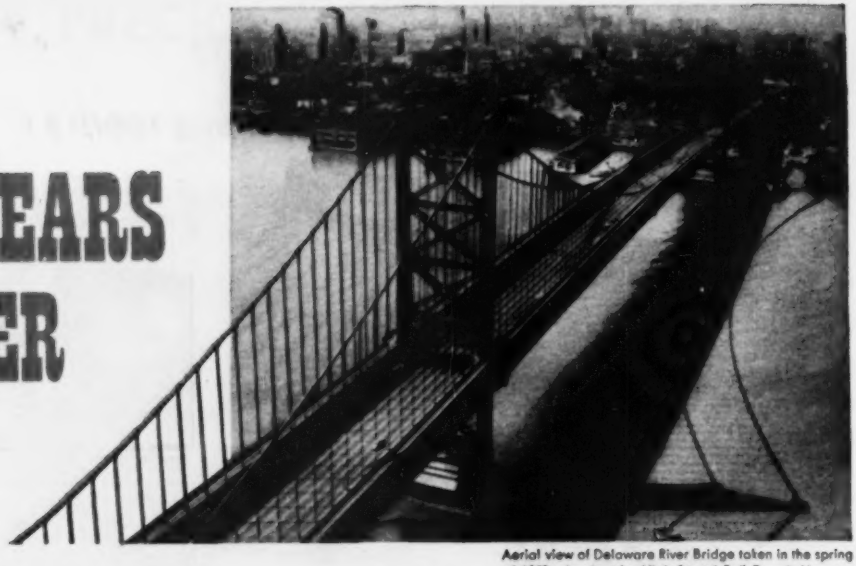


Aerial view of Delaware River Bridge taken in the spring of 1952, showing the High Speed Rail Transit Lines on outer sides of bridge. Photo by Aero Service Corporation.

...a report on the service of Everdur Electrical Conduit on the Delaware River Bridge

The Delaware River Bridge, linking Camden, N. J. with Philadelphia, opened to vehicular traffic in July 1926. In 1934-36, when the High Speed Rail Transit Line was installed, more than 200,000 pounds, or 14½ miles of Everdur* Conduit, in nominal sizes from 1½" to 4", was used for electrification and electro-pneumatic signal operations.

Service conditions were anything but good—and the problems encountered included corrosive industrial gases and almost continual vibration caused by the rapid transit rail cars and 70,000 motor vehicles a day.

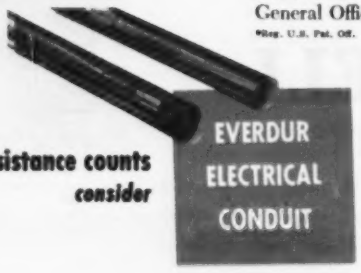
Now, with another bridge expansion project planned, an engineer of The American Brass Company made an "on-location" inspection of the 15-year-old installation. The detailed report concludes as follows:

> *"It is my opinion that the corrosion rate of the unpainted Everdur Conduit installed on the Delaware River Bridge is very low, and that the conduit will last as long as the bridge itself."*

Everdur Electrical Conduit is made of Everdur Copper-Silicon Alloy in two wall thicknesses (R.C. and E.M.T.). Publication E-12 describes this ANACONDA Product in detail. For a copy, address The American Brass Company, General Offices, Waterbury 20, Connecticut.

*Reg. U.S. Pat. Off.

In 1936, at the time of installation, the Transit Line rails were utilized to transport 20-foot lengths of Everdur Conduit to the cable runways.



wherever corrosion resistance counts ***consider***

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Each Panelboard on this page is designed for ONE kind of job...

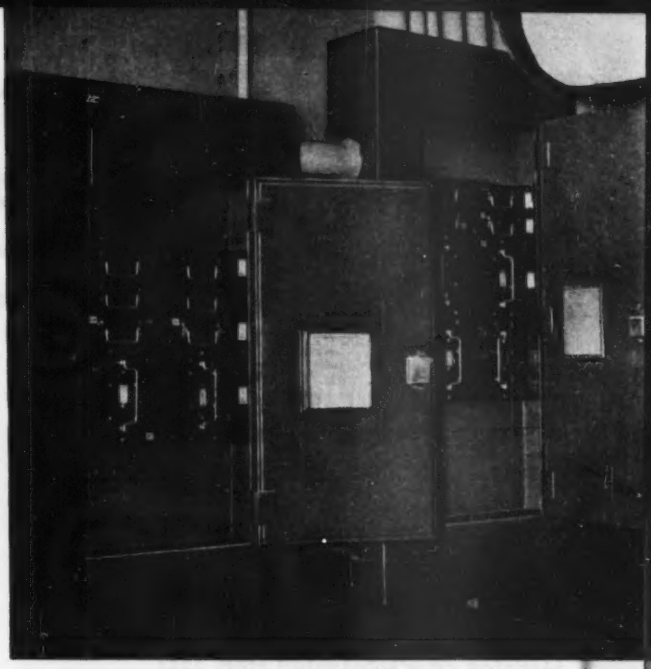
... the job that a "particular" kind of distribution circuit in your plant calls for.

Of course, we both know that your distribution circuits are much the same as those in other plants, but, when you come right down to it, you won't find very many electrical distribution circuits that are *exactly* the same.

To make sure you get the best panel for each application, Trumbull does two things:

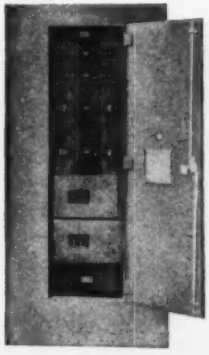
1. Supplies enough *different* types of panelboards to cover every kind of service requirement.
2. Exactly matches the special combination of requirements you set up for each panel through *standardized* construction that permits fast but *individualized* assembly of components.

"Specially assembled" panels of the types shown on this page will exactly meet any distribution panelboard requirement you now have. Others will take care of all your lighter power and lighting requirements.

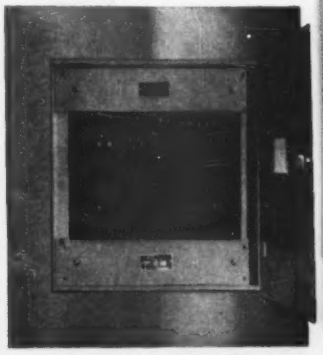


1. Two Trumbull Converti-Fuse Panelboards—the most compact distribution panelboards available. Branches: 30 to 400 amps. Service: 250 volts d-c, 600 volts a-c; single- or three-phase. Interchangeable sections and fuse clips.

2. A Trumbull Swing-Wa Panelboard—an ultra sturdy heavy-duty fusible panelboard with dead-front, hinged cover operation. Branches: 30 to 600 amps. Service: 250 volts d-c, 600 volts a-c; single- or three-phase. Circuits are convertible.



3. A Trumbull Convertible Circuit-Breaker Panelboard—versatile circuit-breaker-type assembly, *sectionalized* for maximum convertibility. Can include space for future circuits. Branches: 15-600 amps. Service: 250 volts d-c, 600 volts a-c.



4. A Trumbull ABH Circuit-Breaker Panelboard—uses same type circuit breakers as the "convertible" panel. Compactly designed to handle lighter loads. Branches: 15 to 50 amps. Service: 240 volts a-c single- or three-phase; 125/250 volts d-c.

Write for bulletin or check soon with your local Trumbull distributor.

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY

PLAINVILLE, CONN.

SORGEL AIR-COOLED DRY-TYPE TRANSFORMERS

Sub-Stations and Power Centers

for indoor installations

Engineered to meet your exact requirements

Not necessary to design or change your installation to fit a "standard"

Any type of primary switch gear.
Metering—primary or secondary, to suit.
Secondary breakers, main, branch, or tie.

Interlocked or automatic throw-over. Draw-out or stationary types. Magnetic trip, or thermal, or combination.

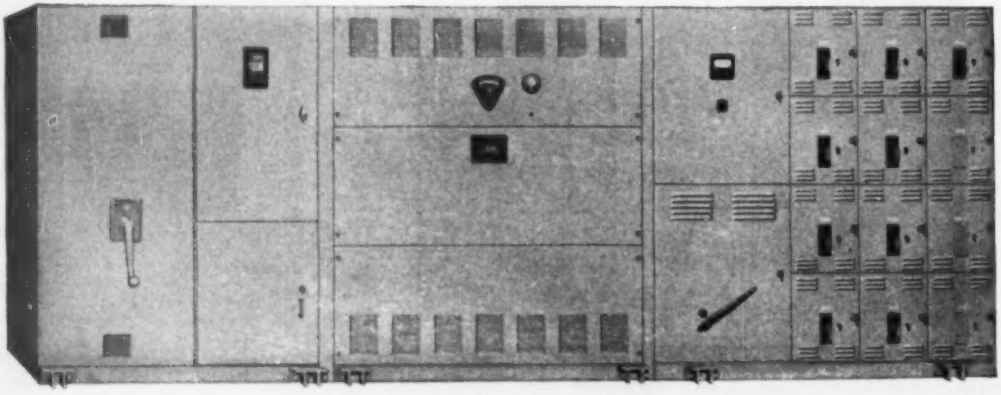
All incorporated with high quality, liberally designed
SORGEL Air-Cooled Transformers

All factory assembled, wired, and tested.
Mounted on a substantial steel base.

Shipped as a single unit or in sections, accurately co-ordinated for **easy assembly on the job.**

Sizes up to 2000 Kv-a. All voltages up to 15 KV.

500 Kv-a., 3-phase, 4160 volt Transformer, equipped with primary oil fuse cutouts



2000 Kv-a., 3-phase, 13,200 volt unit Sub-Station
With forced draft fans, automatically controlled by temperature indicator to increase transformer capacity 25%; primary fused load break switch and kilowatt-hour meter, secondary voltmeter and drawout circuit breakers.

Also a Complete Line of Conventional Air-Cooled Dry-Type Transformers

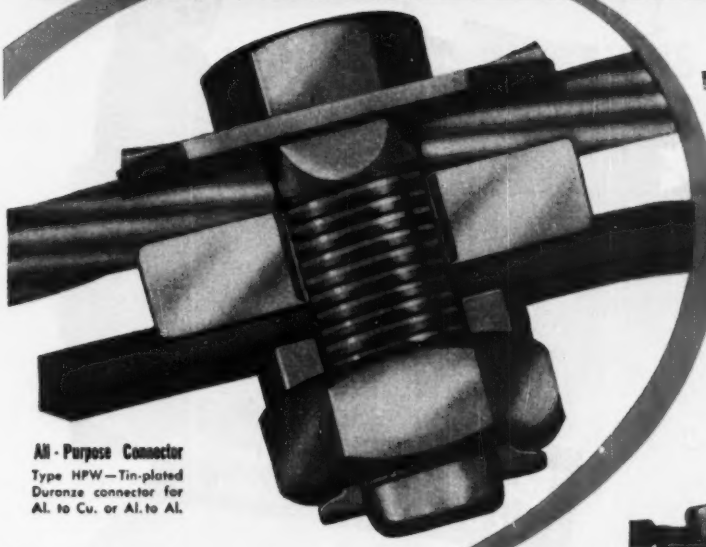
¼ to 2000 Kv-a. Single phase and poly-phase. 120—240—480—600 volts.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 834 West National Ave., Milwaukee 4, Wis.

Pioneers in the development and manufacturing of Air-Cooled transformers

Aluminum Connection Problems?
Use These BLACKBURN FITTINGS!

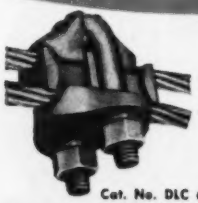


All-Purpose Connector
Type HPW—Tin-plated Duronze connector for Al. to Cu. or Al. to Al.

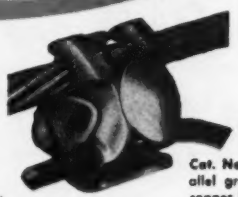
Type AAW — For Al. to Al. — All-aluminum connector with 2 bell-mouthed washers and aluminum contour spacer to hold wires in shape.

Type CA — For Al. to Cu. — Aluminum bolt and nut, one bell-mouthed washer and one tin-plated contour spacer washer.

Type H-3-W — Primarily for 4, 6 and 2 Al. tap to Cu. line. Duronze connector with tin-plated bolt and 2 grooved bi-metallic washers.



Cat. No. DLC 6-0 — Aluminum dead end loop clamp, covers wire range 6—1/0 ACSR.



Cat. No. PAC 6-0 — Parallel groove clamp with copper liners soldered to aluminum body on one side. Also made for Al. to Al. and for armor rod.

ALL BLACKBURN Connectors and Clamps for Aluminum conductor are designed to protect the conductor against crushing as well as against electrolysis. Yet these same fittings have extra gripping ability to produce a tighter and better connection, to give you years of trouble-free service. They are all made of high-strength alloys for extra strength to maintain their tightness through the years.

JASPER BLACKBURN CORPORATION
25 MADISON STREET • ST. LOUIS 6, MISSOURI
Phone CEntral 3007

Always specify BLACKBURN Hi-Strength Connectors & Fittings They'll Give You Years of Trouble-Free Service . . . Send for Samples Today

BLACKBURN *Hi-Strength* CONNECTORS

IT DOES THESE JOBS—AND MORE!

General and Subsidiary Ledgers
Material and Supplies Ledger • Accounts Receivable Control Ledgers • Stockholders Ledger • Operating Statements • Customers Billing • Payroll Check Writing and Earnings Ledger Posting

A SIMPLE TURN of the job selector knob changes jobs in a second—gives choice of any four accounting operations controlled by each sensing panel. Any number of panels may be used, so there's no limit to the number of jobs a Sensimatic will do

Here's new versatility to handle any job... plus effortless speed on every job!

No other accounting machine is so universally useful—can do so many accounting jobs with such speed, such ease . . . at such a saving!

There's practically no limit to the number of accounting problems your Sensimatic can solve! Its most remarkable feature—the sensing panel or "mechanical brain"—automatically directs it through every operation—effortlessly, unerringly. Moreover, the Sensimatic's many other automatic features and highly efficient design save costly working time and operator effort . . . make it simple to learn, easy to use!

Why not see for yourself how much *more* Sensimatics can do for you? Simply call your nearby Burroughs office, listed in the yellow pages of the telephone book. Burroughs Adding Machine Company, Detroit 32, Michigan.

WHEREVER THERE'S BUSINESS THERE'S

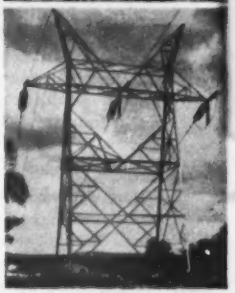
Sensimatic 300 with 11 totals
Sensimatic 200 with 5 totals
Sensimatic 100 with 2 totals

Burroughs

HIRED! A field man

FOR YOUR GOOD RELATIONS DEPARTMENT

Highest Quality Wet-Process Porcelain Shells made on the industry's finest automatic, completely hydraulic presses to assure uniformity and dependability in ALL units.



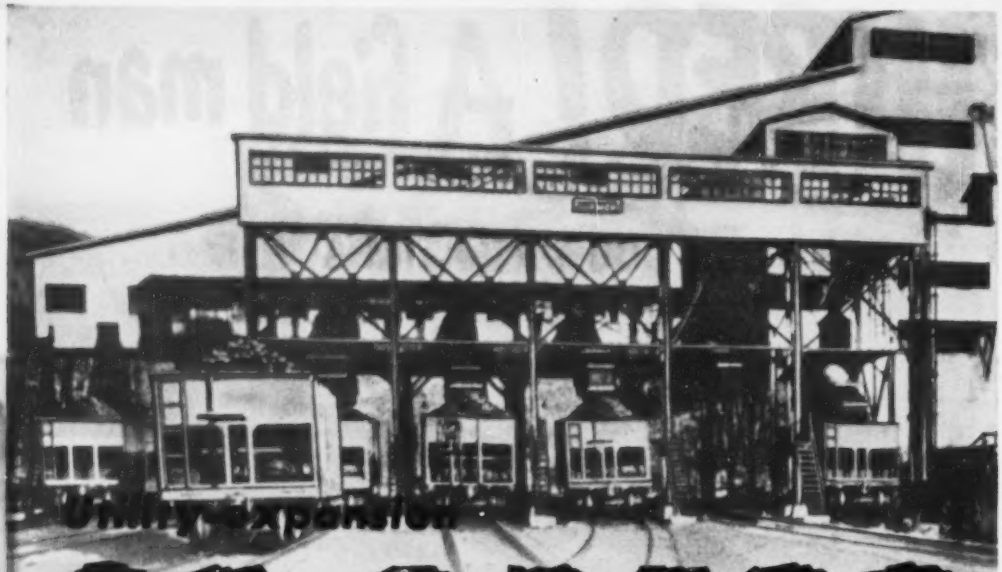
Not all good relations with the public are confined to the home office. Basically, it starts with the kind of equipment you use. Power failures won't make friends—only influence people to say adverse things about your service. Stay on the "Good" side of Good Relations. Buy Porcelain Products' dated, performance tested suspension insulators. They're built to keep working under the most extreme weather conditions. Write for prices and catalog information on our High Voltage Insulator line.

Porcelain Products, Inc.

PARKERSBURG, WEST VIRGINIA

EXPORT REPRESENTATIVE:

Philips Export Corp., 100 E. 42nd St., New York 17, N. Y. U.S.A. Cable Address: "PHILYORK"



GO AHEAD

is written in fields of Bituminous!

● *Production for Freedom* has placed a tremendous burden on the shoulders of the electric power industry—which, since World War II, has spent more for expansion than any other. Bituminous coal has played an important role. In 1951, utilities consumed approximately 102,000,000 tons, the highest of record, or about 20% of the National production. By the end of 1954, the electric industry will have increased generating capacity to 104 million kilowatts—from the 75 million at the end of 1951!

Thanks to vast *known* deposits of Bituminous, such expansion can be taken in stride. And because Bituminous is an efficient source of low-cost power, in a supply sufficient for centuries, utility men will be wise to continue to plan new plants for this dynamic fuel.

In Baltimore & Ohio territory is a large proportion of operating Bituminous mines. New mines—highly mechanized for economical operation—are opening constantly. The coals produced are excellent in quality, wide in variety, and convenient to industrial areas. We'll be glad to advise you—just *ask our man!*

BITUMINOUS COALS
FOR EVERY PURPOSE

BALTIMORE & OHIO RAILROAD

Constantly *doing things* —better!

This *NEW INSTRUMENT* Offers Greater Convenience in Field Use

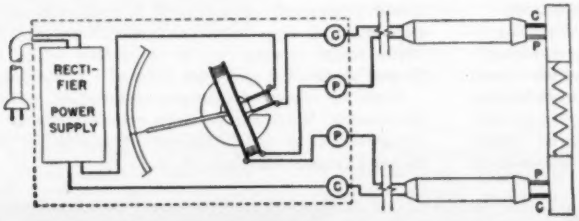
MEGGER® LOW RESISTANCE OHMMETER

This most recent addition to the Megger family of electrical resistance measuring instruments is a general purpose type with self-contained power supply. The set is available in two models, both having the same ranges of 0 to 1000 and 0 to 10,000 microhms. Model 1B carries batteries and Model 1R has a built-in rectifier which plugs into any ordinary lighting circuit outlet. Ample space is provided for the storage of all necessary leads and prods in a compartment of the same case.

The complete unit, with either battery or rectifier weighs only about 19 pounds. It is, therefore, easily portable and convenient to use in the field.

Write for **Bulletin 24-46-EW** which describes these new instruments completely.

Schematic diagram of electrical connections for the Megger Low Resistance Ohmmeter



819

JAMES G. BIDDLE CO.

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

1316 ARCH STREET
PHILADELPHIA 7, PA.

BIDDLE
Instrument News

POCKET INSTRUMENT FOR CIRCUIT TESTING

MIDGET MEGGER®
CIRCUIT TESTING OHMMETER
Measures Electrical Resistance
From 0 to 200,000 OHMS

This ideal tool kit or pocket instrument has a direct reading scale with no calculating to do. Operates independently of the exact voltage of the battery that supplies its current. Supplied with selection of double-range scales. Covers extra wide field of miscellaneous measurements of coils, resistors, contacts, windings, circuits, relays, etc.

B Type with battery switch on the instrument.

S Type with battery switch in one of the test prod handles.

A CONVENIENT KIT FOR THE ELECTRICAL MAINTENANCE MAN

If you are concerned with all-around-the-plant electrical tests and resistance measurements, you will find this handy 6 lb. kit indispensable.

In addition to a *Midget Megger Circuit Testing Ohmmeter* as described above, there is a *Midget Megger Insulation Tester* for detecting dirt, moisture, and deterioration in advance of failure, or for trouble shooting on breakdowns. **Bulletin 21-85-EW.**

James G. Biddle Co.
1316 Arch St., Philadelphia 7, Pa.
Gentlemen:
Please send me items checked:
☐ 24-46-EW ☐ 21-85-EW

NAME
JOB FUNCTION
COMPANY
ADDRESS

LOW-HEADROOM, OVAL-TYPE CONDENSER (with extraction heater in exhaust neck), is typical of several furnished in sizes ranging from 27,500 to 80,000 sq. ft.

SIDE INLET CONDENSER, one-half of several "twin shell" units serving turbine-generators of 20,000 to 100,000 kw.

"TAILORED TO FIT"

Low-headroom design for condensers typical of Worthington "space" engineering

It all began in 1854.

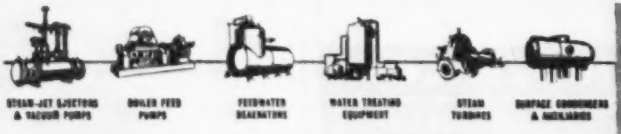
That was the year the first Worthington condenser was installed. From that time, up through the early twentieth-century "evolutionary" period in condenser design, Worthington has constantly kept in step with prime mover and steam power plant development. Today, engineers must design and build condensers within the limitations imposed by high construction costs.

Thanks to the flexible nature of the Worthington "Double Folded Tube Layer", today's "low-headroom" requirements are easily met without any sacrifice in efficiency. For single-shell, beneath-turbine installations, the rectangular box-type (built by Worthington as early as 1904) has given way to the modern "oval" design illustrated above. Other designs include single-shell, side-mounted units with exhaust elbows, and twin shells with horizontal or "T" shaped exhaust connections, popular for outdoor or semi-outdoor plants.

As the capacity of turbine-generators increases, so does the demand for larger condensers. This places more importance on "space" engineering. Worthington—with over a century of experience in the manufacture of steam power equipment—is prepared to build efficient condensers in all sizes to suit any reasonable limitations. (Now under construction for an eastern utility is the largest single-shell unit ever ordered—125,000 sq. ft.)

Write for advice on your new installation, stating requirements. Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Steam Power Division, Harrison, N. J.

Z.2.1



A GREAT TEAM IN STEAM

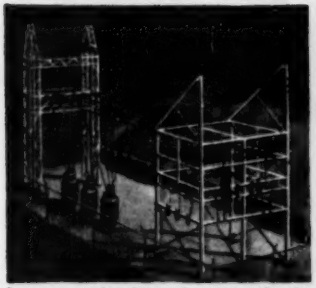
WORTHINGTON

Condensers

(Advertisement)

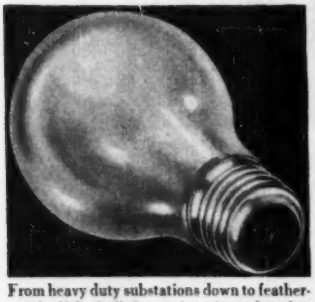
Electrical Applications of Aluminum

Savings in Substations



Important savings in erection costs and maintenance are prime reasons for the growing popularity of aluminum substations with utility companies, co-ops and large industrial users. The light weight and easy fabrication of aluminum permits faster, simpler erection. More shop assembled aluminum components mean less assembly at the job site—less skill is needed in assembly and anywhere from 3 to 7 days can be cut in erecting an average substation. No massive foundations are needed, grounding requirements are much simpler and field drilling is easier—more savings thanks to aluminum. Substation maintenance costs are kept to a minimum because aluminum requires no painting—no costly shut-downs.

Lower Cost Light Bulb Bases



From heavy duty substations down to featherweight light bulb bases, is quite a drop but it's interesting proof that rarely there's a job too large or too small for aluminum. Small jobs can pose tough problems, too. For example, in engineering light bulb bases, it was necessary to develop sufficient rim strength with aluminum of a temper suitable for drawing and working. The method of introducing molten glass to the aluminum base had to be revised. A means of soldering conduction wires to aluminum had to be determined. All the above problems *were solved*—and *at a lower cost* than ever before. True, the savings per unit were small, but on a volume basis they added up to an important figure. Consult Reynolds Aluminum Specialists for assistance on your electrical design problems.

WITH REYNOLDS ACSR MASTER REEL and COIL

Want cost reduction proof? Then see how Reynolds Master Reel and Cable save important time, money and labor.

Reynolds all metal Master Reels sharply decrease handling, storage and bookkeeping costs. *Four Master Reels actually take the place of one hundred wooden reels!* They're easily taken apart and re-assembled around the Master Coil by linemen in the field. They're far stronger than wooden reels and can be used over and over again.

Reynolds Master Coils hold the same amount of conductor as conventional wooden reels. They are carefully waterproofed, lagged and banded for complete protection in transit and on the job.

Plan today to convert to the money-saving Reynolds Master Reel and Coil method. Sooner or later you'll use aluminum—why not now? *Reynolds Metals Company, 2584 South Third Street, Louisville 1, Ky.*

FREE...ACSR MANUAL FOR ENGINEERS CONTAINS COMPLETE INFORMATION, CHARTS AND TABLES. Please request this booklet on your business letterhead.

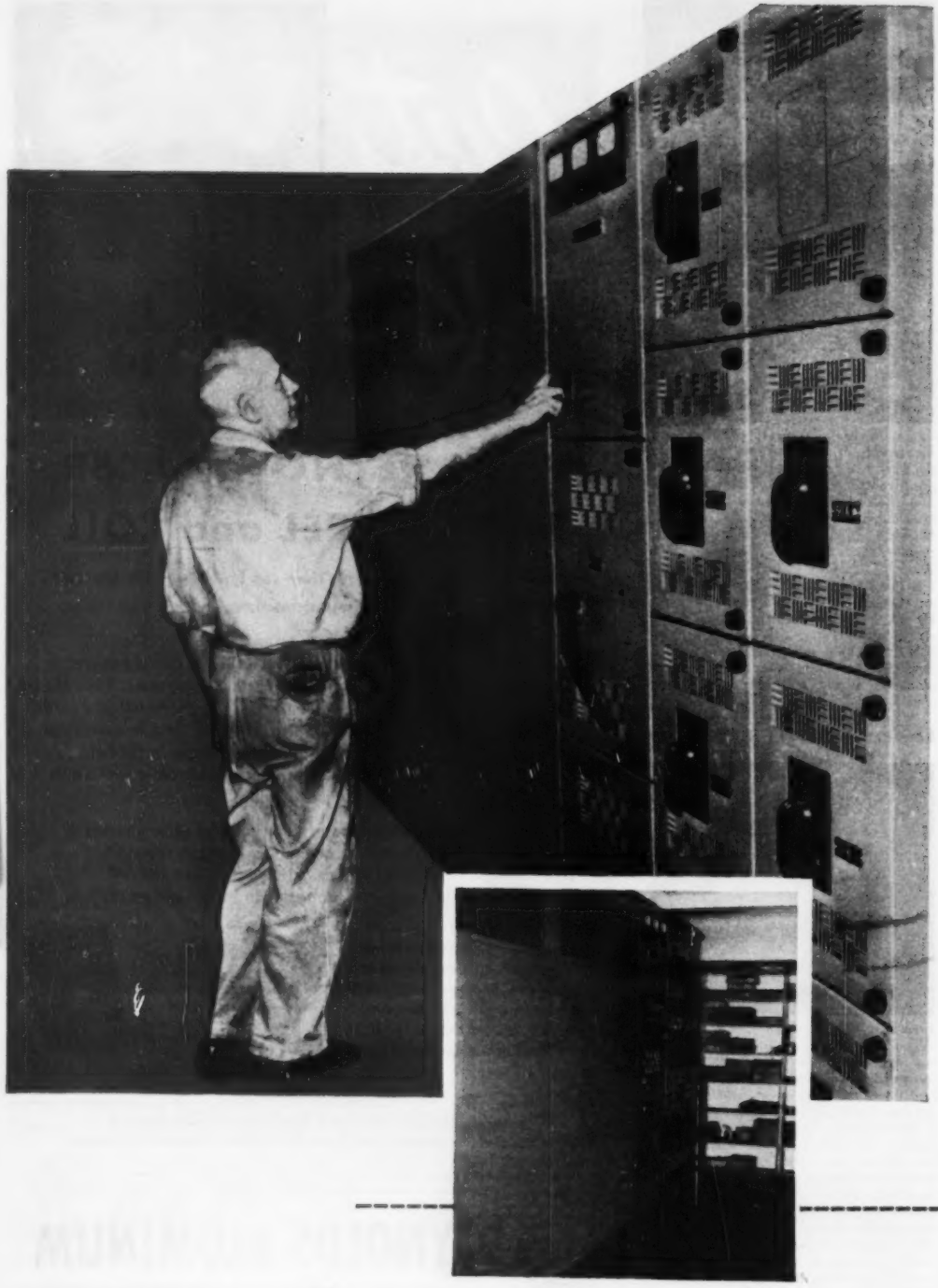
For Complete Information

see your Reynolds distributors listed below or write direct to

Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.

Westinghouse Electric Supply Co., New York, N. Y. (And branches) • North Coast Electric Co., Seattle, Wash. Griffin Manufacturing Co., Dallas, Texas • Southern Electric Supply Co., Houston, Texas • Williamson Sales Co., Shreveport, Louisiana (And branches) • California Electric Supply Corp., San Francisco, California

REYNOLDS ALUMINUM



Westinghouse Power Centers meet SPACE and WEIGHT LIMITATIONS at Kansas City Star

The control room was small—the floor would not support heavy liquid-filled transformers. Confronted with this situation, the Kansas City Star requested recommendations on a power distribution system. The problem was solved with these Westinghouse Dry-Type Power Centers.

Two units are now in operation—with provisions for a third unit if load requirements dictate. Complete customer satisfaction is evidenced by this statement from the Kansas City Star:

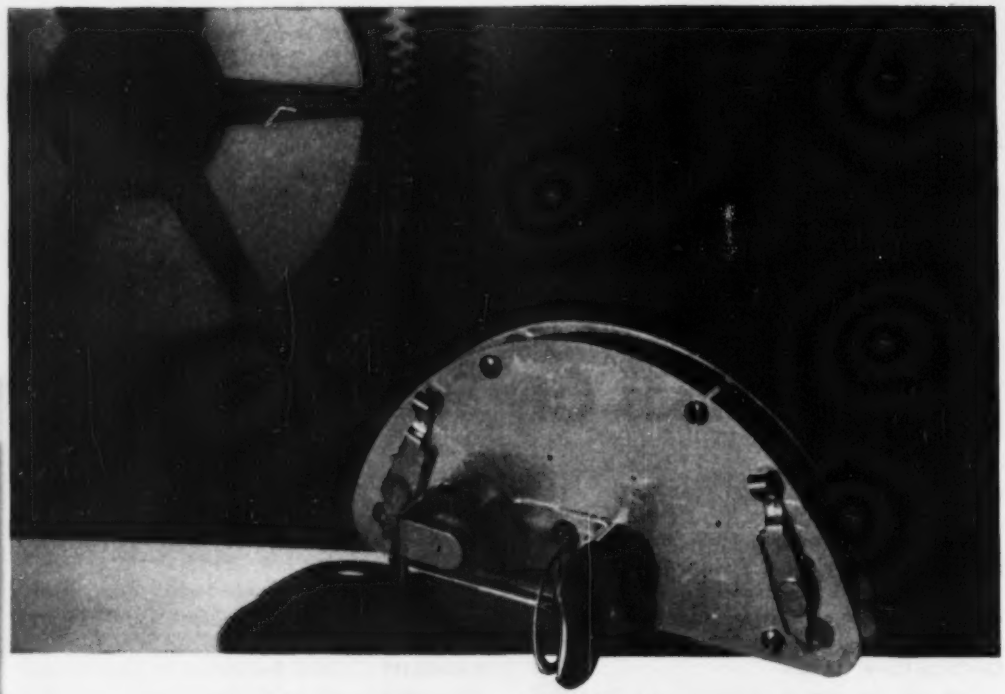
> *"It was desirable to locate the power center adjacent to our press controls. This meant that special consideration be given the problem of protecting our operators from the incoming 13-kv line and connections. The completely enclosed design of the Westinghouse Power Center solved this safety problem.*
>
> *"We like these units because of their low-maintenance requirements. There is no storing, testing or reconditioning of liquids—no gaskets or gauges to maintain—breaker inspection and replacement are quick and easy."*

The Kansas City Star realized many other benefits when they installed Westinghouse Power Centers. For example:

FLEXIBILITY . . . New feeders can be added in minimum time—saving on engineering and labor costs.

ECONOMY . . . Costly vaults eliminated—installed as a unit rather than in separate parts—shorter low-voltage cable runs require less copper.

Westinghouse Power Centers will do a better job of meeting your power distribution needs. These two booklets tell how: The details of Westinghouse Power Centers are discussed in Booklet B-4162 . . . various types of plant distribution systems are covered in Booklet B-4045. Ask your Westinghouse Representative for your free copies, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60768



Sangamo J Meters

have a *permanently adjusted* register mesh

If watthour meters are to operate properly, it is essential that the mesh between the worm spindle and the worm wheel be exact at all times.

On Sangamo J Meters, this mesh is precisely adjusted at the factory by means of the shadowgraph, a magnifying device that facilitates exact adjustment of mesh. The adjustment is permanent because Sangamo's dowel pin mounting arrangement and locking levers for the register insure alignment of the precise original mesh any time the register is replaced after being reset.

The register of the J Meter is designed to assure the least friction and to impose the lightest possible mechanical burden. It is easily handled by the powerful driving system of the J Meter. The combination of this free-running register . . . the oil-less bearing system . . . and exceptionally high driving power permit the J Meter to register fully all of the kilowatthours consumed at even the lightest loads.

Only Measured Facts are Known Facts

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

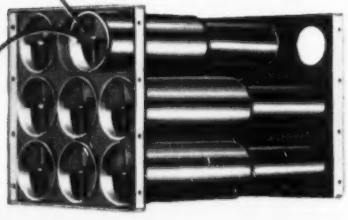
Sangamo J Meters have proved their ability to meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.

SM52-8

American Blower . . . a time-honored name in air handling

Beginning of the end of a fly ash problem

This is a tube assembly, consisting of an inlet tube, a spinner element and a smaller outlet tube.



Tube assemblies are grouped at the factory into convenient bundles, like the one above.

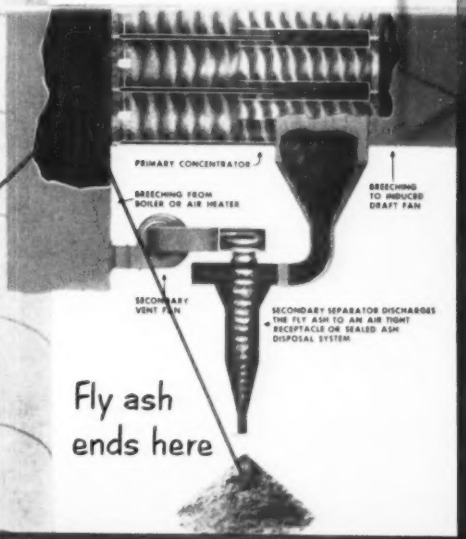
These bundles are assembled in banks to complete construction of the primary unit as your plant requirements dictate.

American Blower Type ST Precipitators are built up in banks, assembled at the factory, shipped in sections.

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

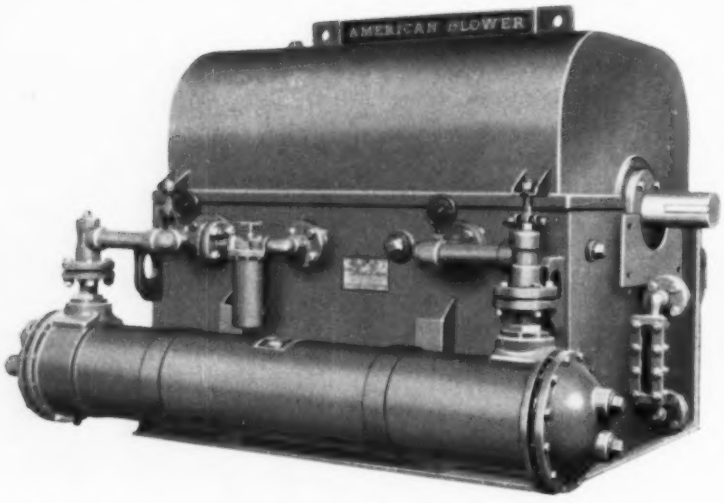

PRIMARY CONCENTRATOR
BREECHING FROM BOILER OR AIR HEATER
BREECHING TO INDUCED DRAFT FAN
SECONDARY VENT FAN
SECONDARY SEPARATOR DISCHARGES THE FLY ASH TO AN AIR TIGHT RECEPTACLE OR SEALED ASH DISPOSAL SYSTEM

Fly ash ends here

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

American Blower . . . a time-honored name in power plant equipment



American Blower Class 4 Gyrol Fluid Drive

Memo to Power Plant Men —

You'll save power, eliminate starting shocks, get stable control over the entire range with American Blower Gyrol Fluid Drives on your forced and induced draft fans. It's the best means we know of to get stepless control from approximately 98% motor speed down to 20% with a simple constant speed driving motor.

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

T&B METHOD
Fittings and Tools for ALUMINUM and Copper Conductors

FOR ACSR & ALL-ALUMINUM CABLES

Tension Splicers

Dead Ends

Jumper Splicers

Repair Sleeves

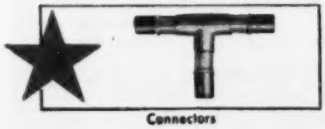
Light Portable Tools (for tower work)

FOR UNDERGROUND & INDOOR INSTALLATION

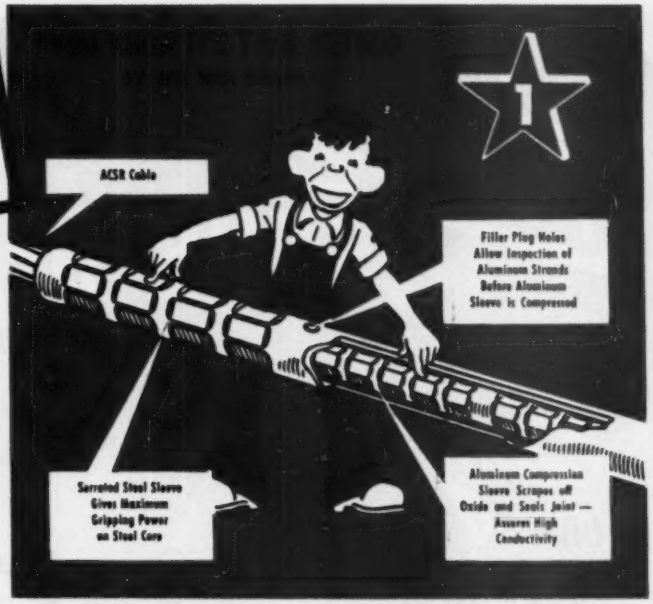
Splicers

Terminals

Taps



Connectors


1
ACSR Cable
Filler Plug Holes Allow Inspection of Aluminum Strands Before Aluminum Sleeve is Compressed
Serrated Steel Sleeve Gives Maximum Gripping Power on Steel Core
Aluminum Compression Sleeve Scrapes off Oxide and Seals Joint — Assures High Conductivity

ACSR Tension Splicers develop minimum of 95% of cable strength

—when installed by the T & B Method

T & B Method Tension Splicers for ACSR are light in weight, easy to install. They take a tight, lasting grip on both steel core and aluminum conductor strands. Inside taper at ends of splice provides dampening effect to prevent vibration failures. Patented T & B Method of compression develops a minimum of 95% of ultimate breaking strength of cable—with a conductivity better than the cable!

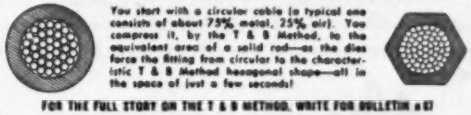
Tooling is Light — Portable — Powerful . . . and Economical!

Tools are easy to carry—easy to use on the tower. An installing head weighing only 34 pounds develops 40-ton pressure. The T & B Method saves you money because one tool and die install all fittings — tension splicers, dead ends, jumper loop splicers—for a single size of ACSR cable.

ENGINEERED RIGHT . . . DISTRIBUTED RIGHT

T & B Method fittings and tools, like all T & B quality fittings, are designed for lowest installed costs. They're furnished exclusively through local T & B distributors under the T & B Plan.

FROM CIRCLE TO HEX IN SECONDS



You start with a circular cable (a typical one consists of about 75% metal, 25% air). You compress it, by the T & B Method, to the equivalent area of a solid rod—as the dies force the fitting from circular to the characteristic T & B Method hexagonal shape—all in the space of just a few seconds!

FOR THE FULL STORY ON THE T & B METHOD, WRITE FOR BULLETIN 67

THE THOMAS & BETTS CO.

INCORPORATED

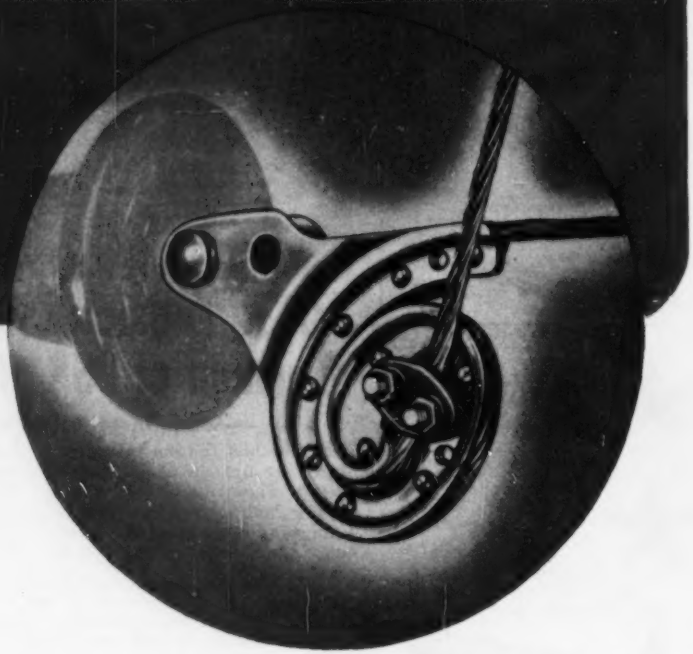
35 Butler Street
Elizabeth 1, New Jersey
Thomas & Betts, Ltd., Montreal, P. Q., Canada

THERE'S A T&B ENGINEERED PRODUCT for every wiring job in the complete T & B line of fittings for all conductors and raceways

Manufacturers of Electrical Fittings since 1898

Reliable SNUB DEADEND

Easy on CONDUCTORS



Easy to INSTALL

The Reliable No. 420 Snub Deadend is made of high strength, non-corrosive aluminum alloy, is low in cost and accommodates No. 2 or No. 4 A.C.S.R. It has been approved for use on A.C.S.R. without armor tape.

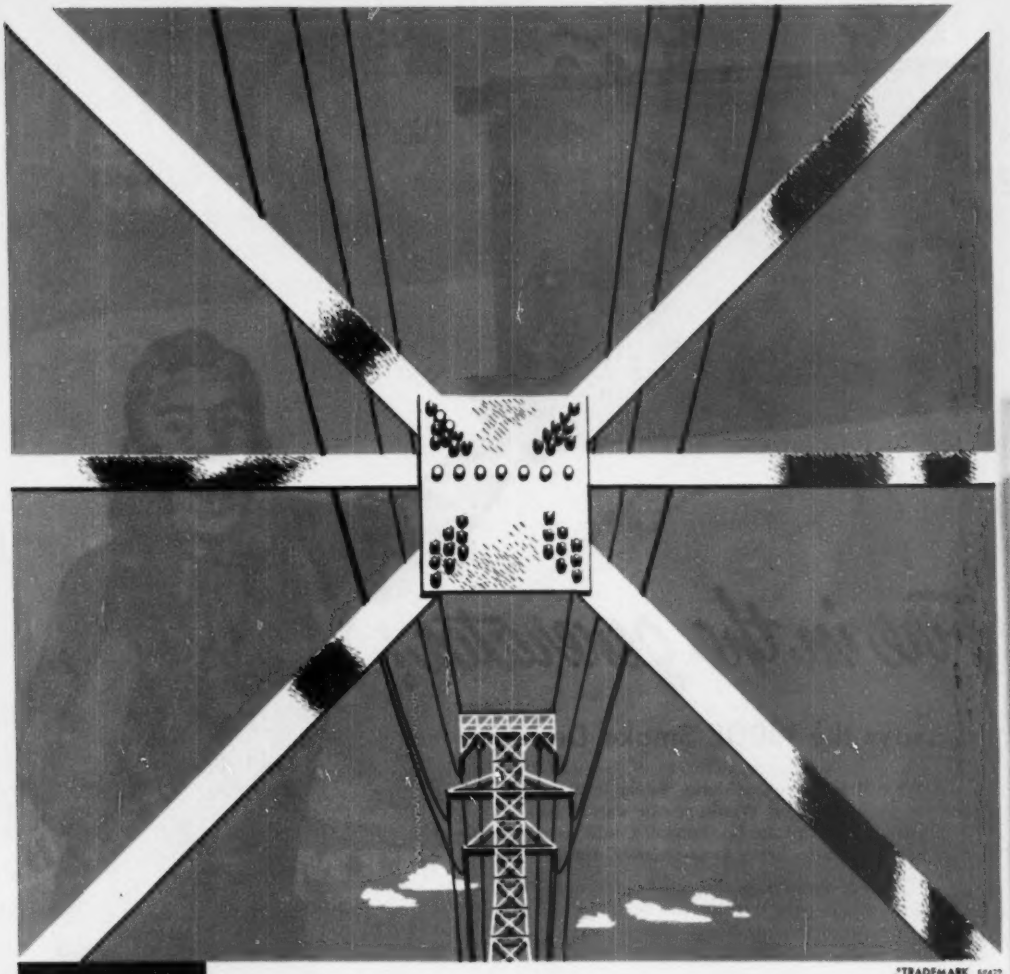
The spiral form of this deadend for A.C.S.R. carries the snub principle to full advantage. This clamp develops approximately the full strength of the conductor and distributes the strain equally on all strands.

It is easy to install. A hole has been provided for attaching a sling which holds the deadend in proper position while the conductor is being attached. The 2-bolt bridge clamps and holds the A.C.S.R., both the aluminum and the steel, after more than a full one and one-half turns of snub. The No. 420 develops the full strength of the wire. Weighing about three-quarters of a pound, this clamp minimizes vibration fatigue strains, prolonging the life of the conductor.

Reliable ELECTRIC COMPANY 3148 CARROLL AVENUE CHICAGO 12, ILLINOIS

OVER 45 YEARS OF SERVICE TO THE UTILITIES

POWER-LINE CONNECTORS and CONSTRUCTION SPECIALTIES



*TRADEMARK

Copper and Aluminum insulated conductors

ACSR transmission and distribution

Copper and Aluminum service cables

Copper, Aluminum and Copper-weld bare and weatherproof

first in electrical conductors

ANACONDA®

wire and cable

ANACONDA WIRE & CABLE COMPANY, 25 BROADWAY, NEW YORK 4, N. Y.

Fire in the generator!

...says the KIDDE Smoke Detector

What if fire were smoldering in the insulation of your generator! Would you be warned in time to avoid a total breakdown? Could you save costly repairs and the heavy loss in "down" time?

A prompt alarm from the new Kidde Smoke Detector gives you just the warning you need. It means: there's trouble in your generator . . . better take action while there's still time!

The Kidde Smoke Detector spots slow burning fires instantly, long before there's enough heat to set off a heat actuated alarm. It's designed especially to protect generators, ventilating ducts, air conditioning systems or any hazard that provides a negative and positive air pressure zone.

Write today for full information.

Kidde

Walter Kidde & Company, Inc.
730 Main Street, Belleville 9, N. J.

Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

new arrival

ON THE CONSTRUCTION SCENE

P&H MITI-MITE

(MODEL 55)

READY TO CUT YOUR COSTS ALL OVER THE MAP

Here's the light-footed, heavy-handed, all-round performance that means less time and lower costs on 101 different jobs — near and far! It's the MITI-MITE — sensational new machine for truck service — it brings you 100% automotive design — and an amazing new idea in power application.

Choose your own make of truck of suitable capacity — new, used, or rebuilt. MITI-MITE gives you the extra stability that means greater work capacity.

Talk about maintenance! You never had it so easy! All gears fully encased, running in oil; antifriction bearings on all shafts and drums virtually lubricated for life.

FULLY CONVERTIBLE — for service as shovel, crane, dragline, trench hoe, clamshell or magnet crane with large machine-type attachments. See your P&H dealer for full information.

Write today for Bulletin TX-127

P&H TRUCK CRANE DIVISION

HARNISCHFEGER CORPORATION

Milwaukee 46, Wisconsin

See your P&H Dealer!

the Joslyn J089 Wireholder

Best IN DESIGN

The original one-piece metal base style.

Best IN MATERIAL

Base and screw are HOT DIP galvanized for long life. Solid copper spun rivet.

Best BY TEST

Withstands 2000-lb (average) dead-end pull and 1800-lb (average) 45° angle pull.

Best FOR INSTALLING

Screws are Lubex treated to reduce friction while installing. Takes one-half the torque required to install untreated screws.

AND, NOW IN THE NEW PACKAGE

For the convenience of those who want small packages for re-shipping or for display—we can furnish boxes containing 10 Wireholders each, 5 boxes per shipping carton. Be sure to specify if you want this handy packaging.

Joslyn

MFG. AND SUPPLY CO.

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Branch Offices in Principal Cities

The Joslyn Co. • The South East Joslyn Co. • Southern Joslyn Co.
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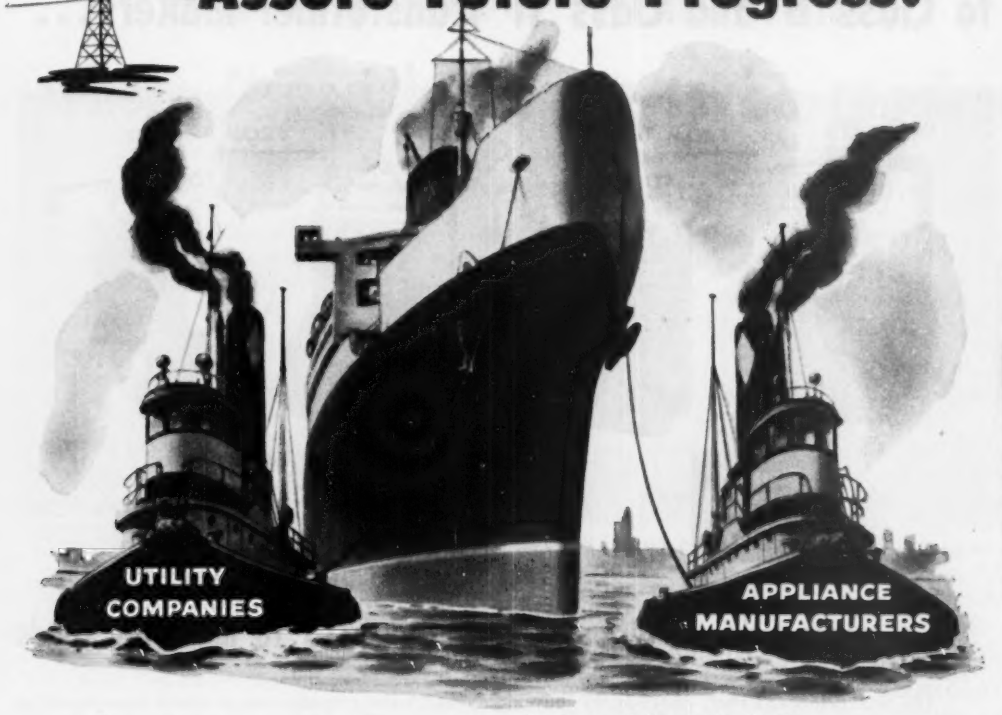
JOSLYN 1902 1952 50th ANNIVERSARY

PULLING TOGETHER Will Assure Future Progress!



The Answer to Increased Residential Revenue

Team-work between the utility companies and appliance manufacturers in the promotion of "growth" or "low saturation" appliances is essential to assure increased residential revenue. Added revenue from major appliances must come from the NEW APPLIANCES such as Dishwashers—Disposalls®—Freezers—Automatic Dryers—Ironers—Automatic Washers—as well as from Electric Ranges and Water Heaters. Most other appliances are for replacement and produce little or no new utility revenue.

With a tradition of close cooperation and understanding of utility problems, Hotpoint is taking the lead in effecting a transition which gradually but surely is bringing complete electric living nearer a reality. In addition to its aggressive promotion of today's low-saturation appliances, Hotpoint leads in the promotion of all-electric kitchens and home laundries, and in building acceptance for a full and complete line of electrical servants—not for just one or two appliances.

To aid in creating a better balanced and more profitable domestic electrical load, we now have available for you new studies on "Balanced Revenue Through Selective Selling" and "Consumer Survey Plans for Retail Salesmen." You can get full information on these studies by writing the Utility Division, Hotpoint Co., 5600 West Taylor Street, Chicago 44, Illinois.

Hotpoint Co.

(A Division of General Electric Company)
5600 West Taylor Street, Chicago 44, Illinois

Quinterra BRINGS SUBSTANTIAL SAVINGS to Class "B" and Class "H" transformer makers...

Above photographs courtesy Chicago Transformer Div., Essex Wire Corp.

. . . each using a different type Quinterra® to meet his needs

THE two "before and after" photographs above do more than show what manufacturers can do when they employ Quinterra as layer insulation. They also demonstrate that the manufacturer is not limited to one type of this thin, flexible, purified asbestos insulation. Any one of several types will help him conserve materials, gain greater safety, raise overload limits, decrease rejects, lessen production costs, and lengthen service life.

For Class "B" operations, he can choose Type 6 . . . the twin-ply Quinterra treated with polyvinyl acetate. It retains its dielectric strength of about 300 VPM at temperatures above the Class "B" maximum of 130 C. Strongest of the Quinterras, it is made by combining and calendering two layers together into a dense, smooth-surfaced sheet. Its excellent tensile and bursting strengths enable assemblers to reach favorable production rates. And it also provides a large square foot per dollar coverage*.

For Class "H" operations or for high processing and ambient temperatures, the manufacturer can choose single-ply silicone-treated Quinterra Type 3. Its dielectric strength of about 300 VPM is retained under continuous exposure to temperatures higher than 180 C, the Class "H" maximum. It also has good moisture-resistance, flexibility, and adequate physical strength for many applications.

Each of these Quinterras is made of the same highly purified asbestos base sheet that has the inherent dielectric . . . and has a hole-free, closed structure. They differ only in the saturant used and in the number of plies. For further information and samples of Quinterra, write to Johns-Manville, Box 60, New York 16, N. Y. No cost or obligation.

*Also true of its companion product, Quinterra Type 5, which is preferable for applications where maximum mechanical strength is not required.

JOHNS-MANVILLE PRODUCTS

Johns-Manville ELECTRICAL INSULATIONS

How you can use RM-ASA Power Transformers where "specials" seem to be required

...and get several months faster shipment and up to 8% lower price

Many power transformer applications require voltages, impedances, and tap arrangements which apparently can be provided only by non-standard transformers. Often, you can meet these requirements with G-E RM (Repetitive Manufacture) transformers which conform to the new ASA standards. At the same time, you obtain attractive savings in both time and money. For example, with RM-ASA Transformers...

YOU CAN OPERATE AT NON-STANDARD VOLTAGE:

One optional feature of RM-ASA transformers provides that the high-voltage rating for each insulation class above 5 kv can be varied over a 20% range. This means, also, that by under-exciting you can obtain secondary voltages other than EEI-NEMA Preferred Voltage ratings. There may be some sacrifice in rating, of course—but you will get more kva per dollar than with a special transformer.

Example: You have a standard 34.5-kv primary, but want a non-standard low voltage of 2300. Select an optional RM-ASA rating of 36 to 2.4 kv. Operate at 34.5 kv. You'll get your 2300 volts.

You pay 1% for the optional high voltage. You save 8% in base price. You get faster delivery.

YOU CAN GET ALL TAPS ABOVE OR BELOW THE ACTUAL PRIMARY VOLTAGE:

With RM-ASA transformers, you get two taps above and two below the rated primary voltage. By selecting an optional primary rating, you can get all four taps above (or all below) your actual line voltage.

Example: Your high voltage is 34.4 kv. You want all taps below this. By selecting 32.8 kv for the primary rating, you get taps at 34.4, 33.6, 32.0 and 31.2 kv.

You pay 1% for the optional voltage. You save 8% in base price. You get faster delivery.

YOU CAN PARALLEL TRANSFORMERS WITH DIFFERENT IMPEDANCE:

Impedances of RM-ASA transformers are fixed at 5.5% to 7.0%, depending on high voltage. While this affects division of load when an RM-ASA unit is paralleled with an existing transformer, it is not as critical as you might think. It seldom results in a serious loss of capacity.

Example: You want to parallel a 34.4-kv RM-ASA transformer (impedance, 6%) with an existing unit having an impedance of 6.6%. Theoretical division of load is about 52%—48%. Often actual division will be even better than this because of external impedances. At worst, you have lost less than 5% in capacity. You have saved 8% in cost, gotten faster delivery.

YOU CAN PARALLEL △-Y WITH Y-△

While in most ratings, RM-ASA transformers are available as △-Y or △-△, a △-Y RM-ASA transformer can almost always be paralleled with an existing Y-△ unit. In fact, there is one advantage: You can ground the high side through the old unit, the low side through the new RM-ASA unit.

YOU HAVE 20 OPTIONS AVAILABLE:

These include: optional primary voltages—load-ratio-control—bushing current transformers—fans or provisions for future fans—junction boxes, and many others. RM-ASA power transformers are available in ratings up to 5000 kva single-phase and 10,000 kva three-phase. The ratings cover all EEI-NEMA Preferred Voltages—high and low—69 kv and below.

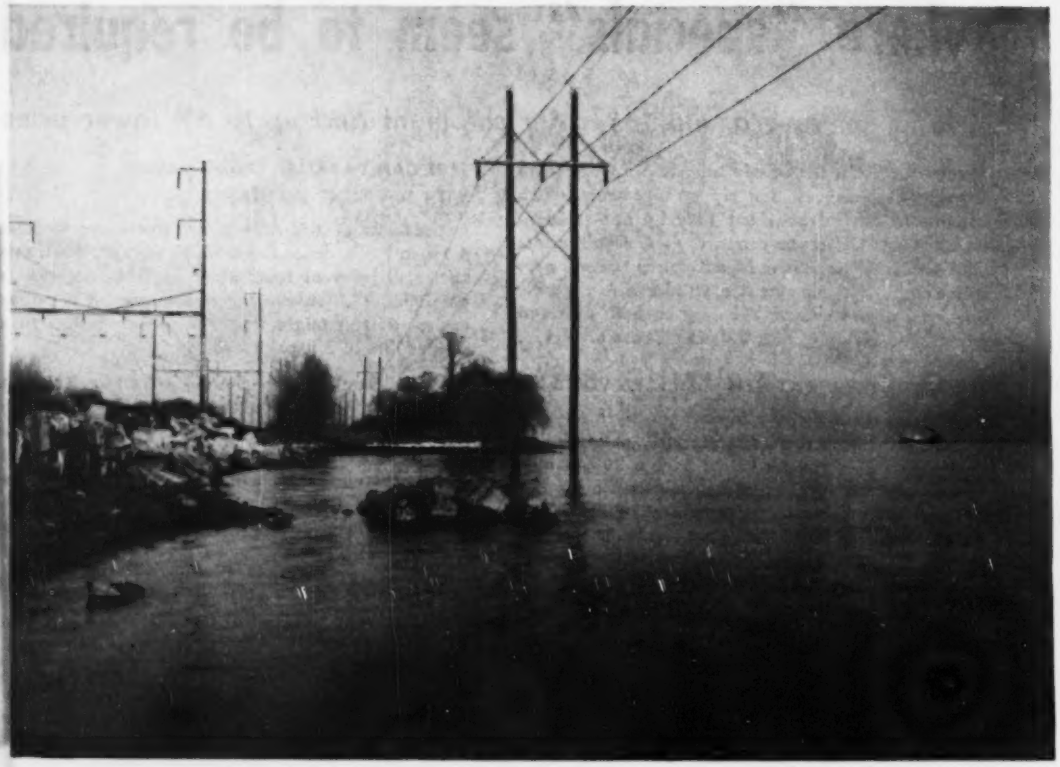
Let us help you apply RM-ASA transformers. For additional information, contact your nearest G-E representative. *General Electric Co., Schenectady, N. Y.*

401-33

GENERAL ELECTRIC

This line is . . .

WAIST-DEEP



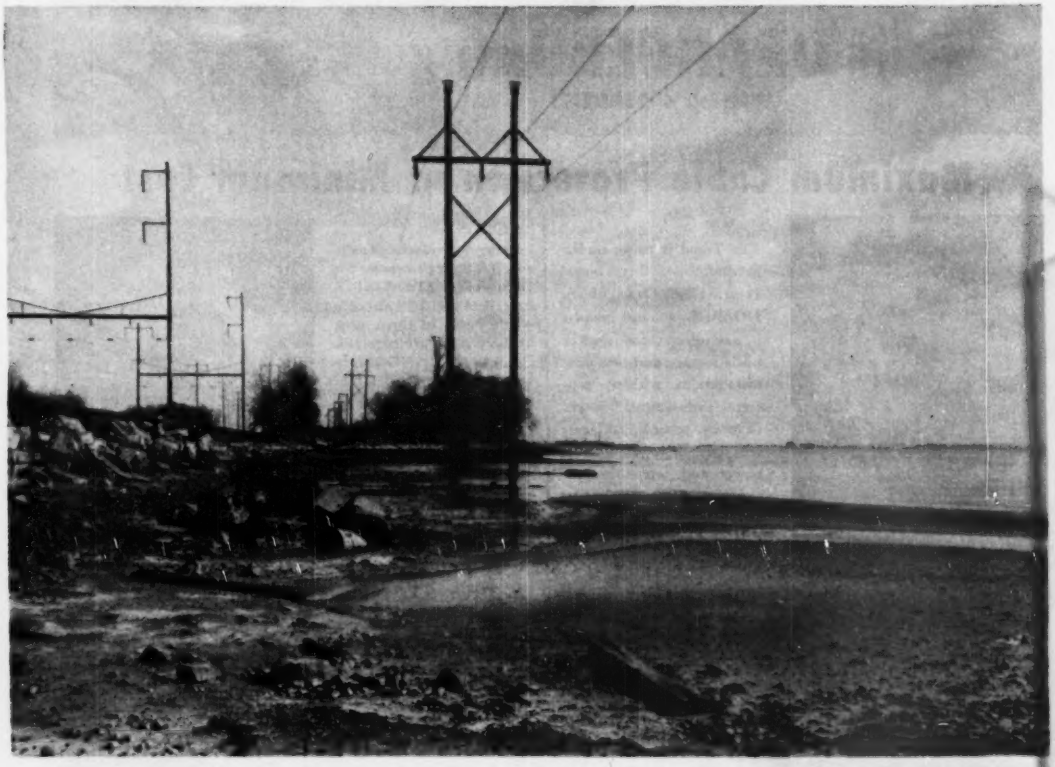
HIGH TIDE finds these poles — part of Delaware Power and Light Company's 67 kv. transmission line — isolated by water.

Twice a day . . . at high tide . . . stretches of this Delaware Power and Light Company line are surrounded by water 5 feet deep. The reason . . . because some poles on the 67 kv. line stand below high water level along the Delaware River.

The wood pole transmission line, 7.8 miles long, has a 100,000 kva capacity. Erected in 1947, it extends from the company's Christiana Substation in Wilmington to a point near the Delaware-Pennsylvania state line. It helps bridge the gap between the firm's 67 kv. transmission system and the Philadelphia Electric Company.

Delaware Power and Light Company . . . like so many outstanding power concerns . . . chose BTC Hi-Line Hardware for this line. Performance to date, the company reports, has been good.

IN WATER



LOW TIDE and here are the same poles after the river has receded. Special equipment was used to haul and erect these structures.

Specify BTC Drop Forged Clamps and Fittings by name for all your transmission line projects. You'll find that they're easier to install . . . give trouble-free performance . . and help hold maintenance to a minimum.

Sold through your insulator manufacturer only

Drop Forged BTC *Hi-Line Hardware*

The **BREWER-TITCHENER**
Corporation
Cortland · New York

On the Job with ORANGEBURG FIBRE CONDUIT

Maximum Cable Protection at Minimum Cost

NOCRETE Installed without Concrete

The Trend is to go underground. Where direct burial is practical, Orangeburg NOCRETE is ideal because it has heavier and thicker walls for one and two duct installations without concrete encasement. Serves factories, schools, colleges, hospitals, drive-in theatres, power and telephone systems, also service entrances, airports. Orangeburg NOCRETE saves time, work and money for the installer.

In every city and state there is a well defined preference for Orangeburg STANDARD, installed with concrete where banks of three, four or more ducts are required. Orangeburg STANDARD is widely used by utilities, municipalities and industry. For 58 years it has been a favorite of design engineers and contractors everywhere.

Quality, dependability and profitable ease of installation has won for Orangeburg STANDARD nationwide approval.

STANDARD Installed with Concrete

No special tools needed

Orangeburg is easily worked in the field, easily sawed, easily tooled with an inexpensive lathe. Long light lengths saves time—speeds up the job.

Taper-Sleeve Joints stay tight

The joints are surprisingly easy to make. A few light hammer taps drive them up tight. Corrosive ground waters do not enter. These Tapered Sleeve Joints are famous because they stay tight permanently.

Less Breakage

Orangeburg is tough, resilient and rugged—seldom breaks when handled with ordinary care. This is added insurance of a good profit—without little losses to write off.

Bigger Payloads

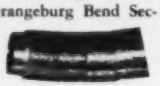
Big capacity truck loads of Orangeburg are easily hauled without damage—and with fewer trips. The transportation costs are low—the job is speeded up—and the final costs are less.

Outstanding Features

Orangeburg lays faster and at lower cost than any other type of conduit. Impermeable wall and tight joints keep out corrosive ground waters • Low coefficient of friction keeps pulling tension on cable to minimum • Protects cable sheath from abrasion when pulled in • Resists acids, alkalies, salt, grease and oil • Light, easy to handle and tool in the field.

Send for Bend Section Folder

This shows ingenious ways to get around trouble spots with Orangeburg Bend Sections. Folder sent FREE on request.



New Catalog 51 is also available. Write to Dept. EW-7 for this folder which tells the story of Orangeburg Fibre Conduit—both STANDARD and NOCRETE. Orangeburg Manufacturing Co., Inc., Orangeburg, N. Y.

NOW BRANDED WITH ORANGEBURG® TRADEMARK

GraybaR ELECTRIC COMPANY — DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT — BRANCHES AND STOCKS IN PRINCIPAL CITIES

GENERAL ELECTRIC SUPPLY CORPORATION

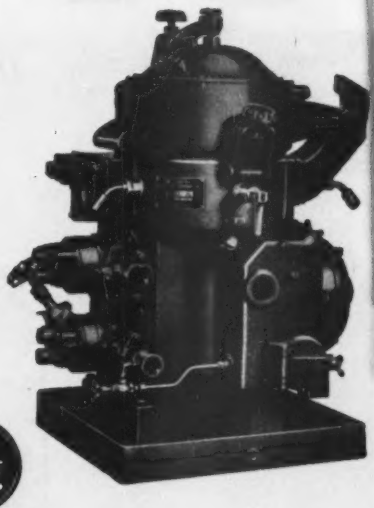
SUPPOSE WATER GOT IN YOUR OIL

--WHAT PRICE WOULD YOU PAY?

A De Laval Oil Purifier insures you against the trouble that water can cause in your turbine lube oil system. Any De Laval machine correctly selected for size in the first place has ample reserve capacity to take care of a sudden water condition. A De Laval is complete protection against water damage, whether due to the gradual infiltration of a few drops of moisture or to a serious leak.

Naturally a De Laval machine also throws out of the oil any solid contaminants that may be present. The result is that a De Laval centrifugal gives ***two-way*** protection — against ***water*** and against ***dirt***. Of the two contaminants, usually water spells the greatest degree of trouble.

The centrifuge alone is sufficient for complete oil purification but a filter may be added to remove fly ash after centrifugal force has taken out the harmful impurities.



THE DE LAVAL SEPARATOR COMPANY
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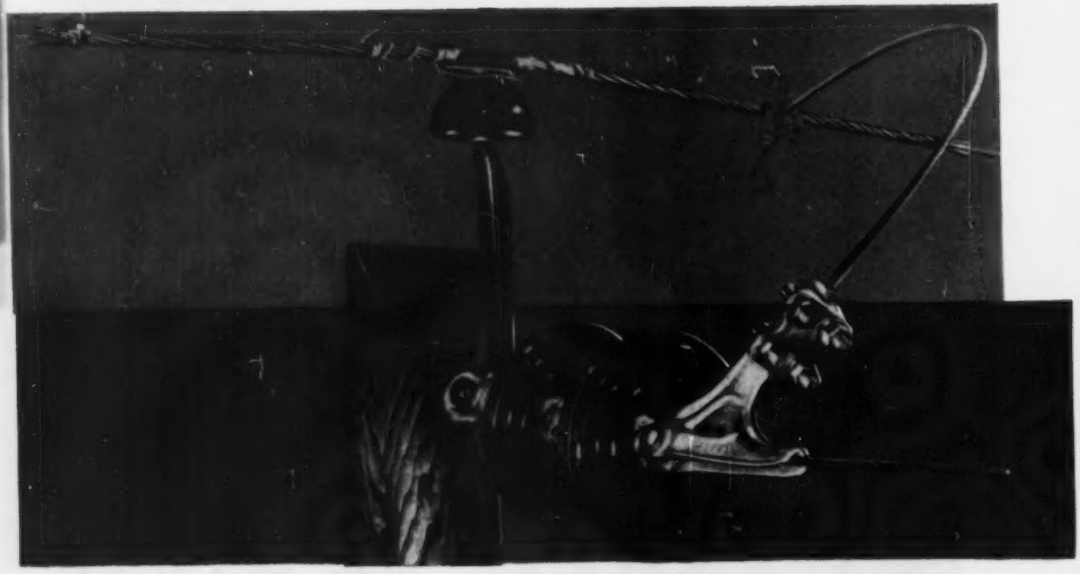
DE LAVAL

Oil Purifiers

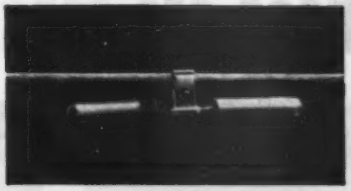
FOR DIESEL LUBRICATING OIL

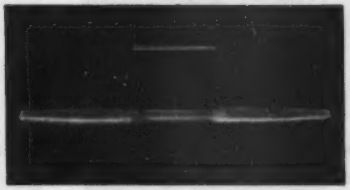
ACSR

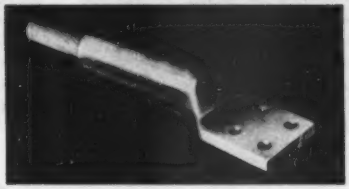


ALCOA

ALCOA







and Alcoa Accessories

When you buy aluminum conductors from Alcoa, you can fill all your requirements in a single transaction—and be sure you're getting the right accessories. For Alcoa originated both aluminum conductors and accessories... continues to develop and improve them.

Designed for best service, there's an Alcoa accessory for every need. Alcoa backs them up with experienced design, laboratory and manufacturing facilities.

Call your Alcoa sales office for aluminum conductors *and* for accessories that are right—on the line.

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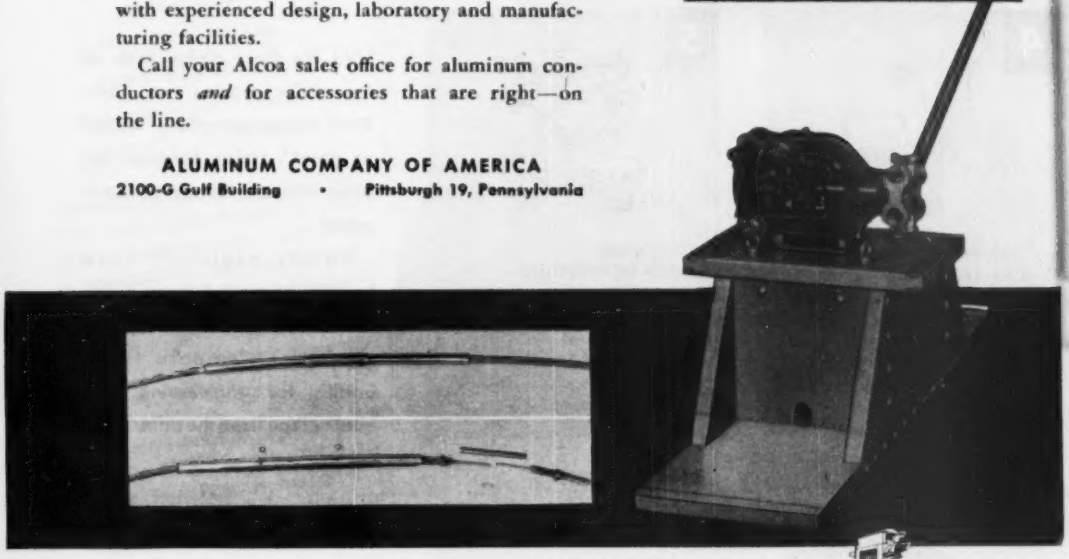
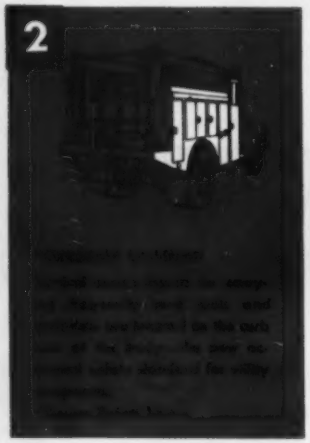
2100-G Gulf Building • Pittsburgh 19, Pennsylvania

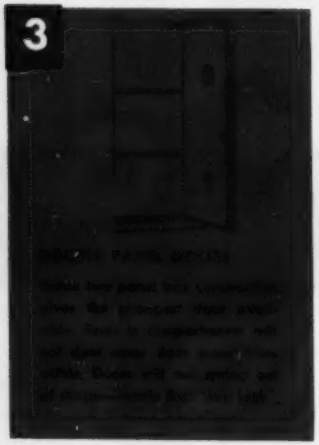


FIRST IN ALUMINUM FIRST IN A·C·S·R

NOW 6:30 P. M. EDST every Sunday—
"SEE IT NOW" with Edward R. Murrow
... brings the world to your armchair ...
CBS Television

These are reasons why Holan features





are so often copied . . .

Look for these Holan *firsts* on the utility bodies you buy. Don't accept something "almost as good". Holan features are often imitated, but never duplicated.

Safety engineers have heartily approved these Holan features introduced to the utility companies. Compare Holan bodies for engineering and quality. You'll see the difference.

The dependable name in utility bodies

J. H. HOLAN CORPORATION

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1810 S. E. 10th Ave., Portland 14, Ore.

WAY DOWN YONDER IN NEW ORLEANS lives our man A. B. "Cap" Caprara. In his job as one of our district managers, "Cap" services the insulator requirements of leading utilities, REA's and municipals throughout Louisiana, Mississippi, Alabama and West Florida. "Cap" estimates that during his career, which included earlier experiences in Georgia and Arkansas, he's sold over a quarter of a million Locke Pin Type insulators. These are being used by some 15 major utilities with properties in 8 southern states, 130 REA Co-ops and some 150 municipal operations. For this reason, "Cap" is in a good position to report to you on "How They're Doin'".

In New Orleans we asked "Cap" Caprara why Southern Utilities favor

LOCKE Pin Types

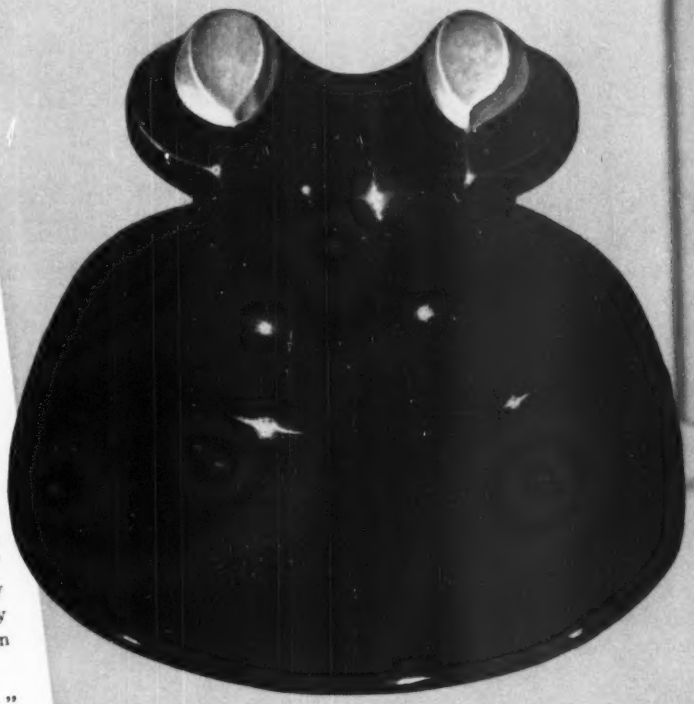
"For one thing," he said, "under lightning and switching surges they're mighty tough to puncture!"

"No puncture-causing porosity in Locke Pin Types," says Caprara, "That's because they're properly vitrified!"

"Everybody knows," says Cap, "that some kinds of lightning can puncture any insulator, regardless of who made it. Fortunately, that kind of lightning doesn't hit lines too often.

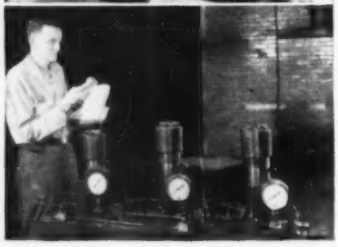
"But most any lightning surge will puncture an insulator which is not properly vitrified. That's why we take such pains at my factory," explains Cap, "to see that every Locke Pin Type is as perfectly vitrified as men and machines can make it."

"As the boys in the factory say," Cap tells his customers, "we don't let an insulator go out of here unless we're absolutely sure it's dye tight!"



On next page "Cap" shows what Locke does to assure you properly vitrified porcelain

"We triple-check," says "Cap" Caprara of New Orleans, "to make sure Locke Pin Types always reach you properly vitrified!"



WE CHECK: "Here's one of our kiln control panel boards," explains Cap. "It consists of the latest electronic equipment. We use it to control the uniformity of the kilns. This, coupled with our process control, is the first check we make to assure you *properly* vitrified porcelain."

WE DOUBLE-CHECK: "Now you're looking at what we call Pyrometric Cones. They record, pictorially, the degree of heat treatment your Locke Pin Types have received during firing. Each carload of insulators coming from the kilns is checked for proper vitrification by this method. It is the second check in our triple-check method of making sure you always get *properly* vitrified porcelain."

WE TRIPLE-CHECK: "Final proof that your Locke Pin Types have been properly vitrified," says Cap, "is the Dye Test. Here you see the equipment used to make this test, as well as one of the men who operate it. The porcelain is first coated with a dye. Then it's cracked open to see if the dye has penetrated. If not, the insulator has been *properly* vitrified. If it has, the porcelain is improperly vitrified and is rejected. Every car of insulators coming from the kiln is subjected to the Dye Test."

"Cap's" conclusion:

"No wonder line crews and operating engineers report that Locke Pin Types are mighty tough to puncture," observes Cap. "Look at the precautions we take to give you porcelain that is always *properly* vitrified!"

YOU ARE EQUALLY SURE of getting a masterpiece of design when you specify other products in the complete line of Locke insulators and suspension hardware. Each pays off in superior performance on transmission and distribution lines, generating stations, sub-station and electrical apparatus. Locke Department, General Electric Company, Baltimore, Md.

LOCKE

LOW VOLTAGE PIN TYPE INSULATORS

HIGH VOLTAGE PIN TYPE INSULATORS

SUSPENSION INSULATORS

SWITCH & BUS INSULATORS

SPOOL INSULATORS

GUY INSULATORS

LIQUID-FILLED BUSHINGS

SUSPENSION & STRAIN CLAMPS

SUSPENSION HARDWARE

ENTRANCE BUSHINGS

Look for this trademark-

Life Span

It's your assurance of added years of trouble-free service

LIFE-SPAN

WESTERN RED CEDAR POLES

Trade Marks Distinguish!

When you see the trade name "Life-Span" permanently branded into the side of a power-line pole, you see the stamp of QUALITY and longer service life. LIFE-SPAN Western Red Cedar Poles are straight, strong, safe and clean—decay resistant from top to butt. Once installed they are set for many, many years of trouble-free service. Write any of the dealers listed.

SOLD ONLY BY THE FOLLOWING:

Naugle Pole & Tie Corp.
Chicago, Illinois

Page & Hill, Inc.
Minneapolis, Minnesota
50 Church St., New York, N.Y.

B. J. Carney & Co.
Spokane—Minneapolis

Schaefer-Hitchcock Co.
Sandpoint, Idaho
(Suppliers for Joslyn Mfg. & Supply Co.)

CONSOLIDATED TREATING CO.
MINNEAPOLIS, MINNESOTA

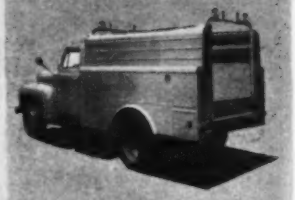
5 Ways to Speed Up Your Service Work

Series 44-90 can be installed on chassis having C.A. dimension of approximately 48"

Series 44-75 for chassis having approximately 40" C.A. dimension.

Series 44-104 for single or dual rear wheel chassis having 60" C.A. dimension.

Series 44-L-90 for chassis having approximately 48" C.A. dimension.



Series 44-L-104 for 60" C.A. chassis having single or dual rear wheels.

POWERS *American* AEB

SERIES 44 and 44-L

SERVICE AND MAINTENANCE BODIES

These five bodies have an impressive record for saving time and money on service jobs. Compartments are equipped to keep tools and supplies safe and orderly — easy to inventory before leaving for the job — easy to find upon arrival. The bodies are adaptable to a wide variety of service operations, and each model can be transferred to a new chassis when the original truck wears out. If you're looking for new ways to get more productive man hours, you'll want full information on Series 44 and 44-L bodies. Why not send for complete details . . . now?

Clip this coupon and attach to your letterhead!

McCABE-POWERS AUTO BODY CO., 5900 N. Broadway, St. Louis 15, Mo.
Please send me complete information on the following:

- ☐ Series 44-75
- ☐ Series 44-90
- ☐ Series 44-104
- ☐ Series 44-L-90
- ☐ Series 44-L-104
- ☐ Line Construction Bodies
- ☐ Revolving Aerial Ladders
- ☐ Hydraulic Towers
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Name ..... Title .....

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City ..... Zone ..... State ..... ST

POWERS *American* AEB DIVISION

PUBLIC UTILITY BODIES & EQUIPMENT

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MAIN OFFICE AND PLANT
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WESTERN OFFICE
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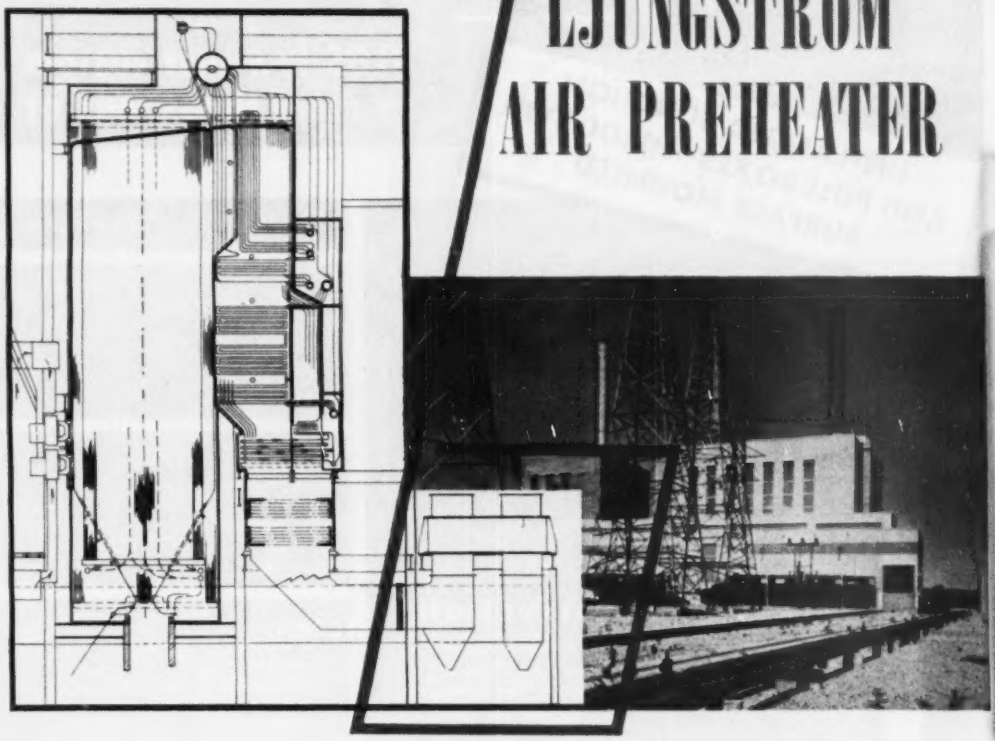
Million Pound Boiler at Sunbury Station of the Pennsylvania Power & Light Company

equipped with

LJUNGSTROM AIR PREHEATER



The latest addition to the Pennsylvania Power & Light Company's new Sunbury Station is a unit that adds 125,000 kilowatts to this utility's power output and increases the Station's capacity to over 400,000 kilowatts. The station was designed by Ebasco Services, Inc. under the utility's supervision, and built by the latter.

The reheat boiler for this unit was furnished by Foster Wheeler Corporation. It is fired by pulverized coal and has a capacity of 1,000,000 pounds of steam per hour at 1525 psi and 1005 F., reheated to 1005 F.

This Foster Wheeler boiler incorporates a Ljungstrom Air Preheater, which preheats combustion air to 543 F., and cools exit gas to 281 F.

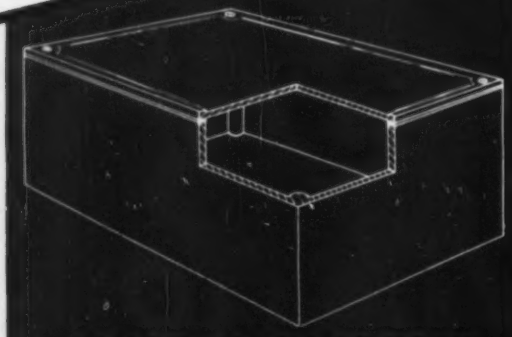
Since the war, the total capacity of steam generating units equipped with Ljungstrom Air Preheaters – installed, under construction or on order in industrial and utility plants throughout the country – comes to well over 285,000,000 pounds of steam per hour. Every boiler manufacturer has included Ljungstrom Air Preheaters in prominent installations made during this period.

THE Air Preheater Corporation 60 East 42nd St., New York 17, N. Y.

164 STANDARD

UNFLANGED JUNCTION AND PULL BOXES—H1200 TYPE SURFACE MOUNTED

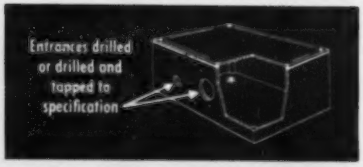
PLUS low-cost custom to meet thousands of

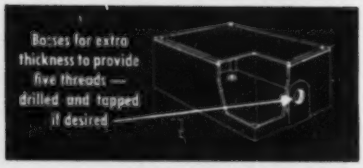


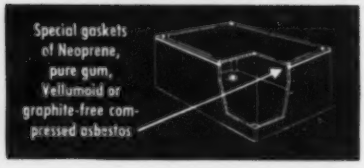
STANDARD CONSTRUCTION

Cast iron — hot dip galvanized • Rubber Gaskets • Lengths from 4" to 48" • Widths from 2" to 36" • Depths from 2" to 17" • Larger boxes have adequate additional screws in order to insure weather-tightness

TYPICAL



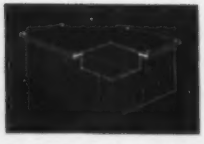




Some of the other Major Types of Cast

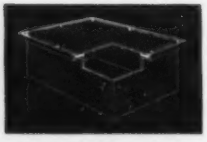
BOXES BY HOPE

available with or without custom variations



H8000 — Flat flanged boxes for surface mounting. 87 sizes from 4x4x3 to 36x36x12. Also for Class II (Groups E, F, and G) hazardous locations

H3200 — Hinged boxes for surface mounting. 128 sizes from 5x5x3 to 36x36x12. Also available with terminal blocks factory-mounted in place



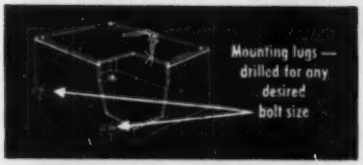
H7000 — Flanged recessed cover boxes, for flush mounting in concrete or for surface mounting. 51 sizes available from 4x4x3 to 30x24x12

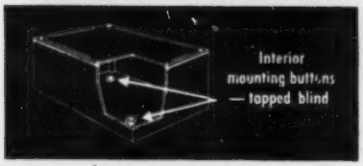
HOPE ELECTRICAL PRODUCTS CO., INC.

SIZES

modifications
special needs

MODIFICATIONS



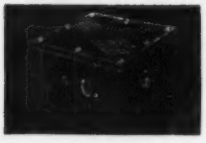


CHECK THESE REASONS FOR BUYING CAST BOXES* BY HOPE

- ☑ 1. Hundreds of sizes carried in stock for prompt shipment.
- ☑ 2. Custom modifications factory-made promptly and at moderate cost.
- ☑ 3. All boxes of strong, dense, durable cast iron. Excellent machining qualities permit easy hole cutting and sharp threading in shop or in the field.
- ☑ 4. All boxes hot dip galvanized for lasting protection without need of recoating.
- ☑ 5. Weatherproof construction—tightly gasketed closure between box and cover will not permit entry of rain, snow, sleet or dust under normal conditions.
- ☑ 6. Convenient to order — your local distributor will handle your requests for standard *or* special BOXES BY HOPE.

***OUTLET BOXES and FITTINGS • JUNCTION and PULL BOXES • HINGED CABINETS • TERMINAL BOXES • EXPLOSION HOUSINGS**

GET THE FULL STORY
on the Hope Line—
WRITE
on Company Letterhead for Catalog



H5800 — Checkered cover sidewalk boxes for flush mounting. 53 sizes from 6x6x4 to 36x24x14. Checkered cover cross-ribbed for extra strength

338 WILSON AVENUE, NEWARK 5, N. J.
Mitchell 2-4426

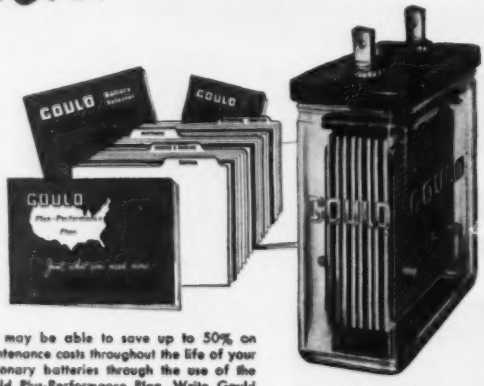
EXPLOSION HOUSINGS

In addition to its line of boxes for general-service conditions, Hope manufactures a complete line of explosion housings which have been extensively used in Class 1, Groups C and D hazardous locations. Typical applications include chemical, petroleum and powder plants, pump rooms and grain elevators.

PLANTÉ

The Battery That Never Grows Old!

Buy Planté and you'll be amazed at the number of years they'll stay in continuous, active service. In fact, if you purchase these *pure lead* batteries today, chances are *you* will retire before *they* need replacement. These "Aristocrats of Stationary Batteries" have the lowest per annum cost of any battery on the market!



You may be able to save up to 50% on maintenance costs throughout the life of your stationary batteries through the use of the Gould Plus-Performance Plan. Write Gould Battery Information Headquarters for full details.

Gould Planté—
America's Finest Stationary Battery!

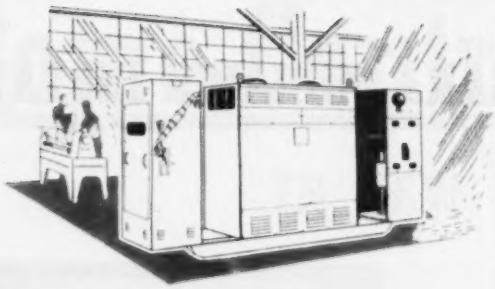
GOULD

Industrial Batteries

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

custom-built transformers



When custom design is a factor . . .

TRANSFORMERS are the only product The Standard Transformer Company builds . . . the most important part of the load center. You thus have complete freedom in your choice of accessory equipment.

Specify the type and make of switchgear you prefer . . . STANDARD will quickly produce a complete, well-integrated unit, exactly designed to the proper dimensions and arranged according to your requirements.

As STANDARD has specialized in transformer design and application for more than 30 years, unusual assemblies are usual with us. You write your own ticket.

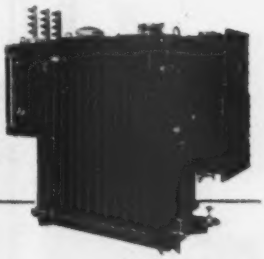
Whether unit installations are required for indoor, outdoor or underground, STANDARD will meet your most exacting requirements and include accessory equipment made by the supplier you prefer.

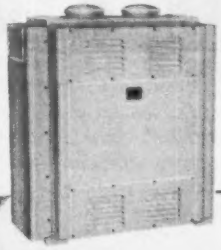
Write today for specific information.

WRITE FOR BULLETIN CL-50

See and read about actual transformer installation on the job around the world . . . evidence that your confidence in STANDARD is well placed.

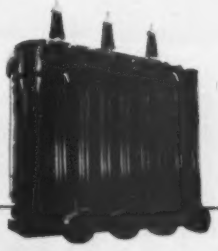
Askarel filled subway type network transformer, 500 KVA, 12480 to 216Y/125 volts, 3-phase, 60-cycle, complete with high voltage disconnect and grounding switch, low voltage network protector, and electrical interlocks.





Dry type air-cooled, load center transformer, 225 KVA, 3-phase, 60-cycle, 2400 to 120/208Y volts. Gang operated oil-fused cutouts are included with operating handle which is accessible through door in end of cabinet.

Power transformer, 10,000/12,500 KVA, 3-phase, 50-cycle, voltage 69,000Y to 13,200Y, with tertiary winding of 3500 KVA, air blast equipment for supplemental rating, low voltage terminal chamber and wheels.



Everything points to . .

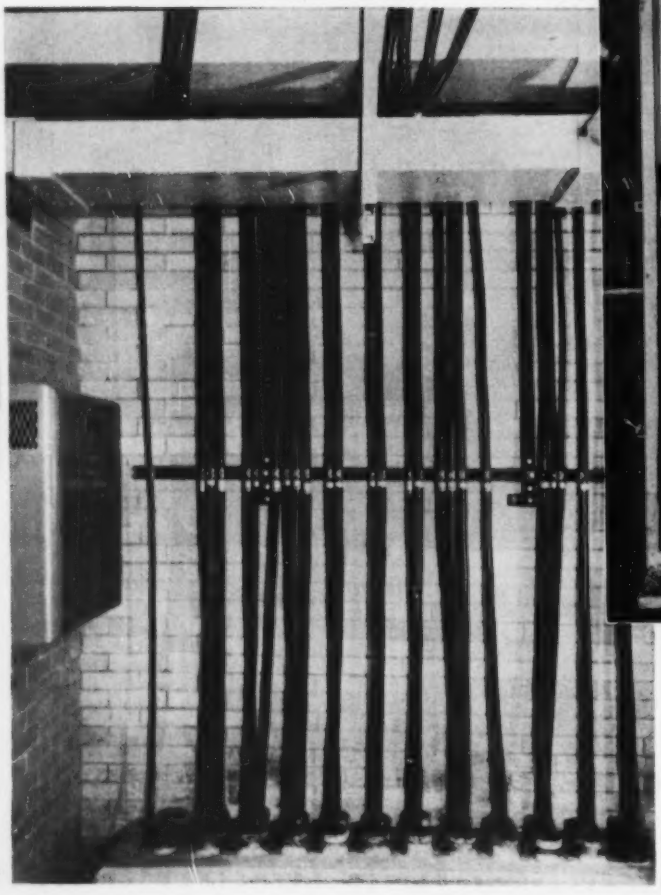
Standard

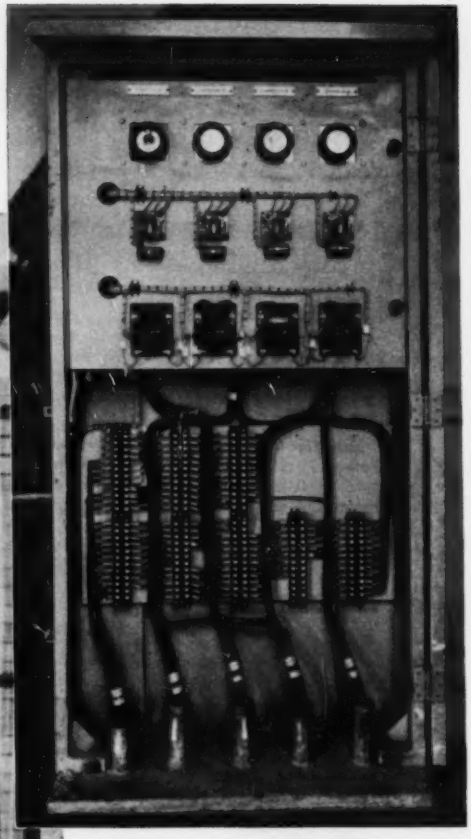
THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

NIAGARA MOHAWK INSTALLS



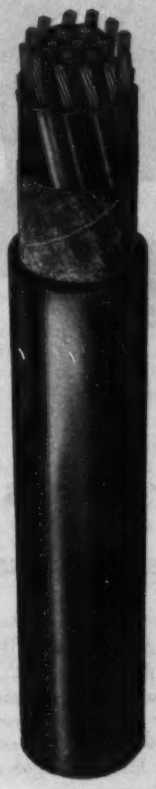


Glossy, well-lubricated surfaces make these cables easier to handle, strip and splice. Clear, permanent color-coding assures easier circuit tracing.

Small in diameter, Rome Thermoplastic Insulated Cables permit neat installation—save space and materials.

Rome Control Cable

IN NEW STEAM STATION



Niagara Mohawk's new steam station at Dunkirk, New York, is one of the most modern in the world. Modern layout, modern equipment, modern machinery—and modern Rome Thermoplastic Control Cables.

And at Albany, New York, where Niagara Mohawk is building a 320,000 kw steam station, Rome Thermoplastic Control Cables also are being installed.

Like all Rome Control Cables, these are specifically engineered to the application involved. Individual conductors are insulated with RoLene (polyethylene).

RoLene has outstanding electrical characteristics. It is practically unaffected by water, electro-osmosis and low temperatures. It resists most chemicals, weathering, oxidation, and oils. It keeps dielectric losses low at all frequencies. (Dielectric constant 2.3; power factor .0004.)

Rome Synthinol forms the tough, protective sheath. This specially formulated compound provides exceptional resistance to moisture and corrosion, abrasion and flame. It has good aging characteristics, assuring long service life under severe operating conditions.

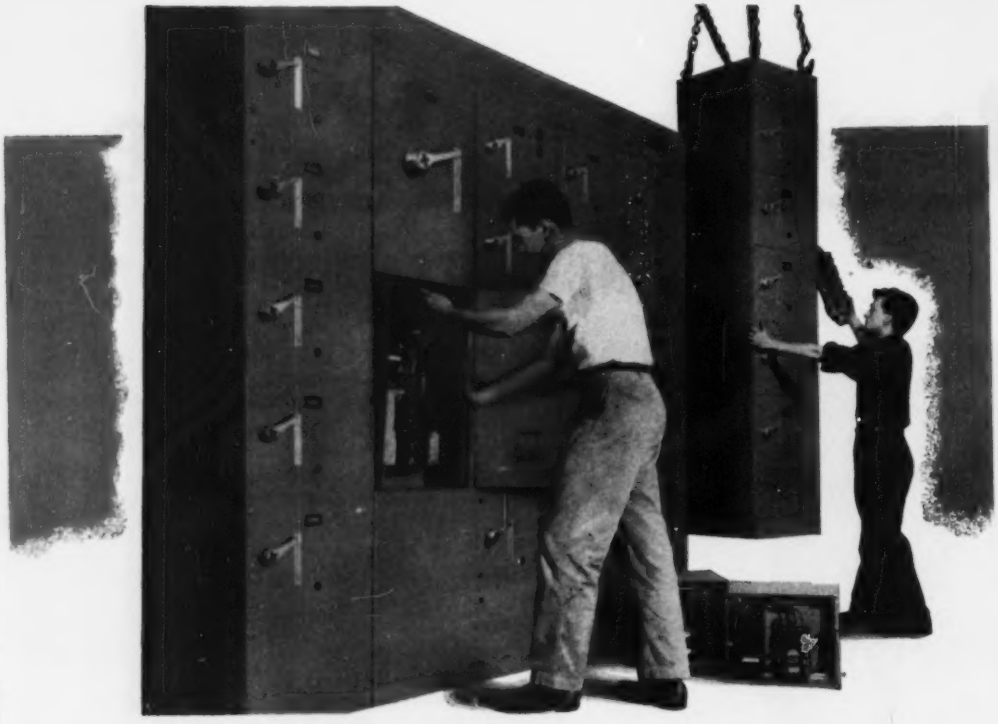
Rome Thermoplastic Cables may be buried direct in the earth, installed in ducts, trays or on racks, strung aerially—or used in circuits combining all four conditions. Recommended for operating temperatures up to 80°C.

For further information on these and other Rome Control Cables, write for a copy of the new Rome Power and Control Catalog.

IT COSTS LESS TO BUY THE BEST

ROME CABLE
Corporation
ROME • NEW YORK
TORRANCE • CALIFORNIA

ROME CABLE ROME, N.Y.



FLEXIBILITY

of electrical components...of structural units

Another reason why most control center buyers specify WESTINGHOUSE

No matter what type and size of motor control you need, you can house it in a Westinghouse Control Center. That's not so unusual in itself. But, the important thing is the ease with which these control units are initially installed and then interchanged as circuit requirements change.

The secret is in the standardization of cubicle dimensions. The height of these units are 14″ or multiples of 14″. Thus, all units are completely interchangeable. One 28″ unit can replace two 14″ units—three 14″ units can replace one 42″ unit—etc.

Standardization of vertical structures also aids flexibility. You can arrange, rearrange, add or subtract vertical structures to meet any requirement. Each structure dovetails perfectly with its neighbors.

Need help? Westinghouse offers you the services of an application engineer to work with you on your control center planning. Call your local Westinghouse office today. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-27023

YOU CAN BE SURE...IF IT'S
Westinghouse
CONTROL CENTERS

EDISON selects NICHROME* V WIRE

for new, high-accuracy, long life MINIATURE RELAYS

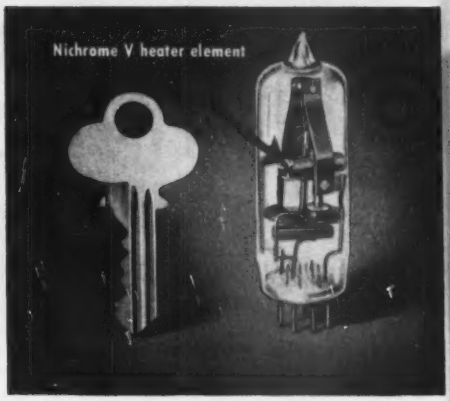
Edison's new space-saving miniature thermal time-delay relays, scarcely larger than a door key, are built to handle big jobs—accurately and dependably, day in and day out.

They offer the simplest, most trouble-free, and least expensive way of introducing delay periods into electric circuits. Thus they are ideal for control functions relating to cathode protection, motor starting, "hold-overs," overload protection, automatic cycling, and numerous applications where magnetic relays have hitherto been used.

Since accuracy of operation depends, essentially, upon the consistent performance of the extremely small heater, wire of this winding must be *exceptionally stable*—be capable of retaining its physical and electrical characteristics *indefinitely*.

Nichrome V alloy, unique product of Driver-Harris, fulfills these all-important conditions. With a temperature co-efficient of resistance that remains constant between 20°C. and 500°C.—a considerably wider temperature range than actually here involved Nichrome V assures uniform, precision performance. And being highly resistant to heat and corrosion, it assures *outstanding stability for a lifetime.*

This particular application serves to emphasize other desirable properties which make Nichrome V wire extremely suitable for heating, or resistance units required to occupy very limited space. For example: Only a few milliamperes of current are utilized by the Edison miniature thermal relay. The heater winding must, therefore, have high resistance in order to produce sufficient heat to deflect the bi-metal contact strip. The electrical resistivity of Nichrome V (650 ohms/cmf) permits a short length of one-mil-diameter wire to be used, thus saving space; and the high tensile strength of Nichrome V (200,000 p.s.i. at 20°C.) eliminates breakage in winding operation.



New Edison Time-Delay Relay — Model 207 Standard Voltages 115—27.5—6.32 Hermetically sealed. Vibration and shock proof. Ambient compensated -60°C. to +85°C. Wide range of delay periods available.

For products whose successful operation depends upon application of stable electrical alloys, highly resistant to heat and corrosion, you'll find Nichrome and Nichrome V offer *plus values* that are unequalled. At the present time, these alloys are on allocation; but if you will let us have your specifications, we shall be glad to make recommendations and serve you to the best of our ability.

Nichrome® is manufactured only by

Driver-Harris Company

HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco

*T.M. Reg. U.S. Pat. Off.

Sold in Canada by The B. GREENING WIRE COMPANY, LTD., Hamilton, Ontario, Canada

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

In quest of the "skeleton of speech"

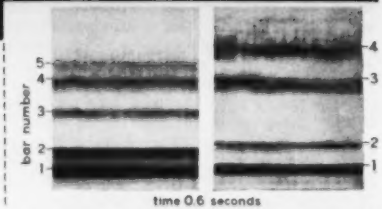
In the famous Quiet Room at Bell Laboratories, this young volunteer records speech for analysis. Scientists seek to isolate the frequencies and intensities which give meaning to words . . . stripping away non-essential parts of word sounds to get the basic "skeleton" of speech.

A child or an adult . . . a man or a woman . . . an American or an Englishman—all speak a certain word. Their voices differ greatly. Yet listeners understand the word at once. What are the common factors in speech which convey this information to the hearer's brain?

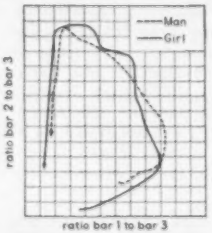
Bell scientists are searching for the key. Once discovered, it could lead to new electrical systems obedient in new ways to the spoken word, saving time and money in telephony.

Chief tool in the research is the sound spectrograph which Bell Telephone Laboratories developed to make speech visible. Many kinds of persons record their voices, each trying to duplicate an electrically produced "model" sound. While their voice patterns are studied, a parallel investigation is made of the way human vocal cords, mouth, nose and throat produce speech.

Thus, scientists at Bell Laboratories dig deeply into the fundamentals of the way people talk, so that tomorrow's telephone system may carry your voice still more efficiently—offering more value, keeping the cost low.



Spectrograms of young girl's voice (right) and man's voice making "uh" sound as in "up." Horizontal bars reveal frequencies in the vocal cavities at which energy is concentrated. The top of the picture is 6000 cycles per second. Pictures show how child's resonance bars are pitched higher than man's.



The word "five." Graph shows ratio of frequency of spectrogram bars. The solid line is for a girl and the dotted line is for a man. Note the similar patterns despite pitch differences. Human hearing extracts the speech sounds from this sort of pattern in the identification of words. Scientists aim at machines that can do the same.

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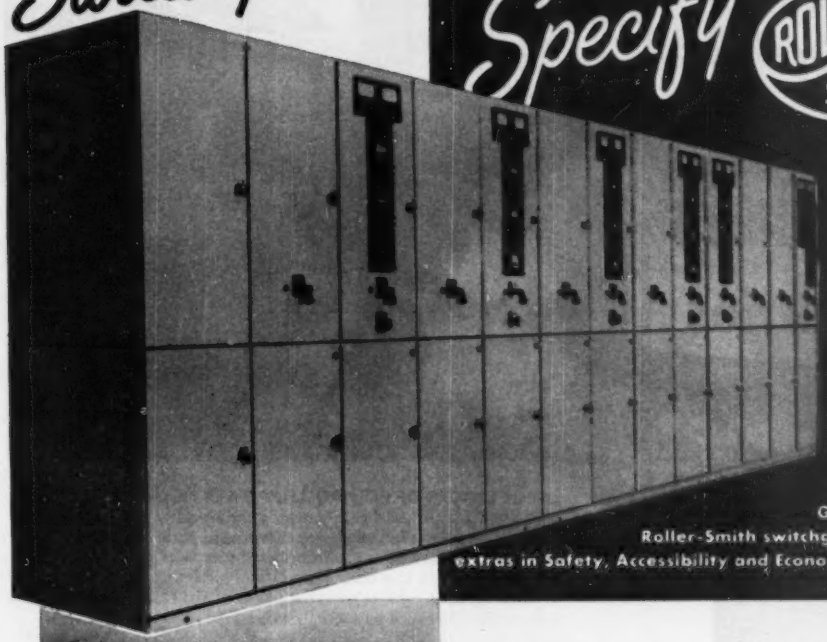
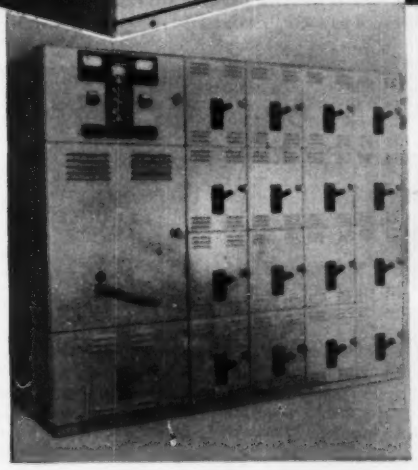


Get all the extras
Roller-Smith switchgear provides . . .
extras in Safety, Accessibility and Economy of operation



● **SAFE** All equipment is metal enclosed . . . weather proofed when required . . . built to NEMA and AIEE standards for safe, dependable performance. The "up-to-the-minute" design of Roller-Smith switchgear assures *extra* safety for operators.

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● **ECONOMICAL** All Roller-Smith equipment is precision-built according to your specifications . . . tested *before* you get it. When you specify Roller-Smith, you can count on *extra* long, trouble-free operation with less "down time" for repairs.

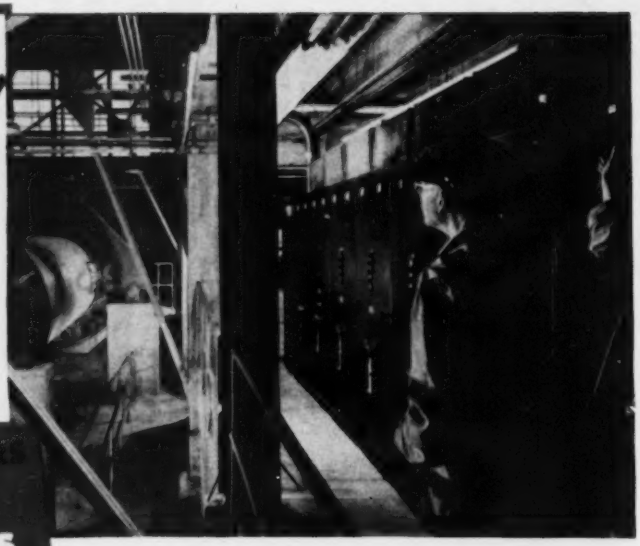
Consult your nearest Roller-Smith representative, or write to us for catalogs which fully illustrate and describe our complete line of low voltage draw-out; moderate duty, vertical lift Metal Clad; and heavy duty Metal Clad switchgear.

ROLLER-SMITH CORPORATION

Bethlehem, Pennsylvania

ROLLER SMITH

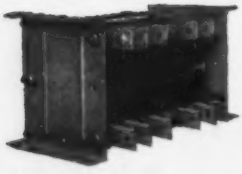
CONTROL *Engineered* for specialized industries



LARGE BLOCKS OF CONTROLLED POWER are used in many highly specialized industries. For example, grinding silica sand into powder fine enough for use in lamp bases, dinnerware, bathroom fixtures, abrasive wheels — even porcelain finishes for appliances — is the job of six tube mills like this one. Turning the mills with their heavy loads of sand and flint pebbles takes the power of six 125-horsepower, 440-volt motors controlled by specially engineered starters.

A-3671

THESE STARTERS are designed to control the motors driving this high inertia load. They are full magnetic wound-rotor motor controllers. All the operator does is push the "start" button. Acceleration is automatic.



HEAVY DUTY RESISTOR BANKS in the motor secondary circuit cut down current inrush. Time delay relays allow the proper interval of time for each accelerating contactor to close and cut out resistance in successive steps.

WHEN 2500 TO 5000-VOLT lines are available, select Type H Starters for similar jobs. Current-limiting fuses, safety interlocks, meters, relays . . . everything needed for your application is built in. Ask for Bulletin 14B6410A.

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There are Allis-Chalmers controllers for use in every industry . . . starters for squirrel-cage, wound-rotor and synchronous motors. For starters to 2500 hp and up to 5000 volts — check with your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin, for bulletins.

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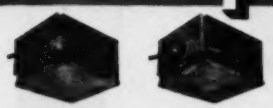
the complete line of fluorescents and incandescents



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▲ "ALL-SQUARE"

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ARISTOLITE ...hinged glass panels swing open for easy cleaning from floor with handy servicing tool. Also with center Eggcrate louvres. For 2, 3 or 4 40-watt or 2 or 4 4-ft. SLIMLINE lamps; ceiling or suspension, unit or continuous mounting. Write for Bulletins 812 and 820.

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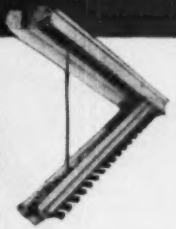
▲ TRUCOLITE®



GUTHLITE ... the revolutionary "Jacknife" Hinge Luminaire that swings down for easy relamping or cleaning right from the floor! For 2 40- or 2 85-watt or 2 4-ft. SLIMLINE lamps; ceiling or suspension, unit or continuous mounting. Simplest fixture to install. Bulletin 845.

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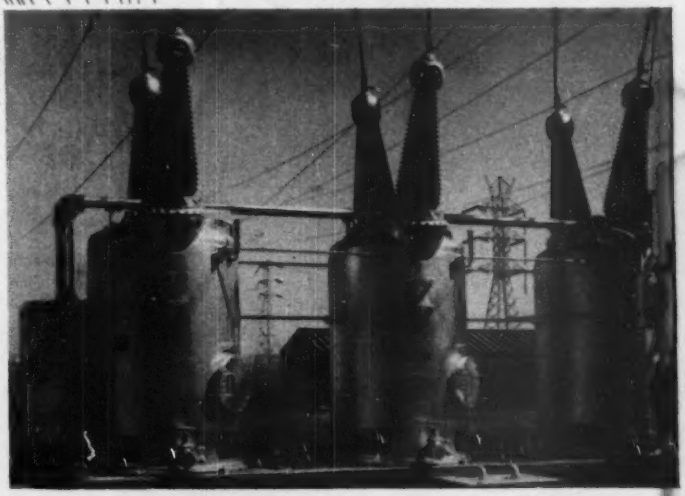

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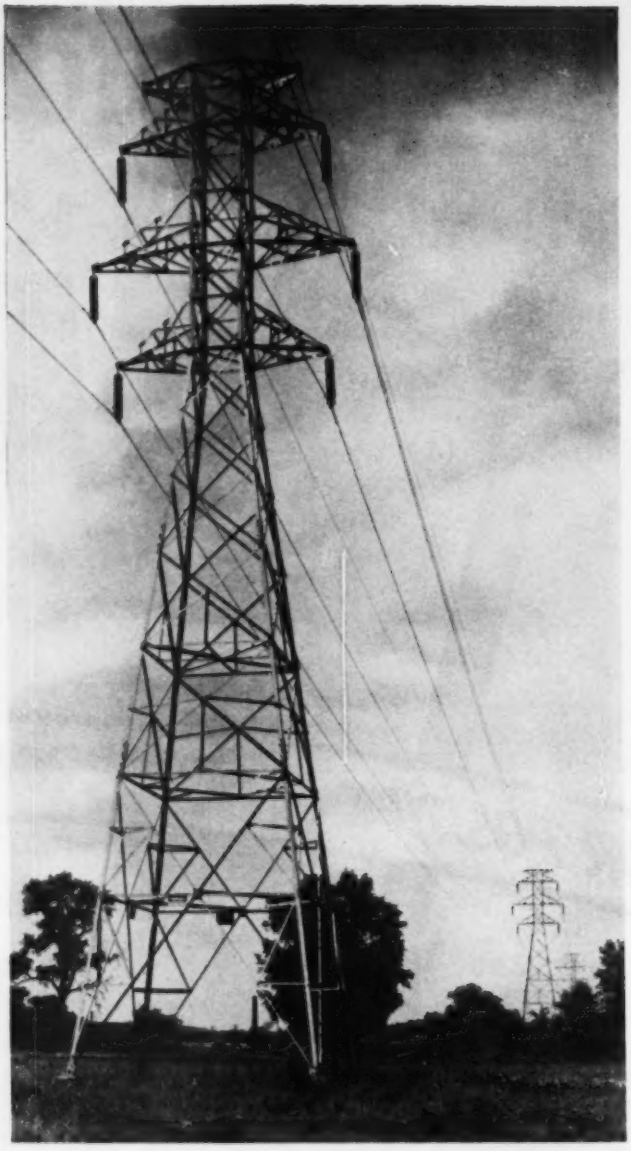

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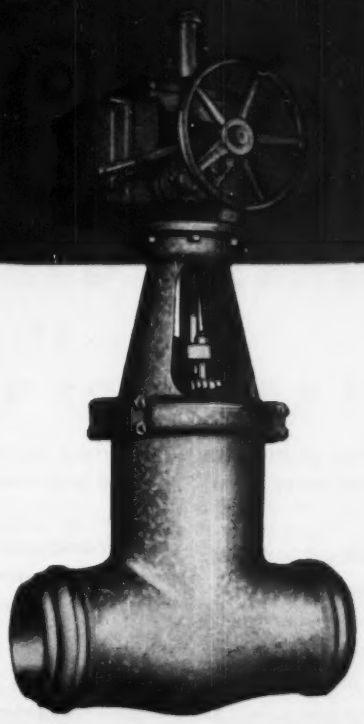

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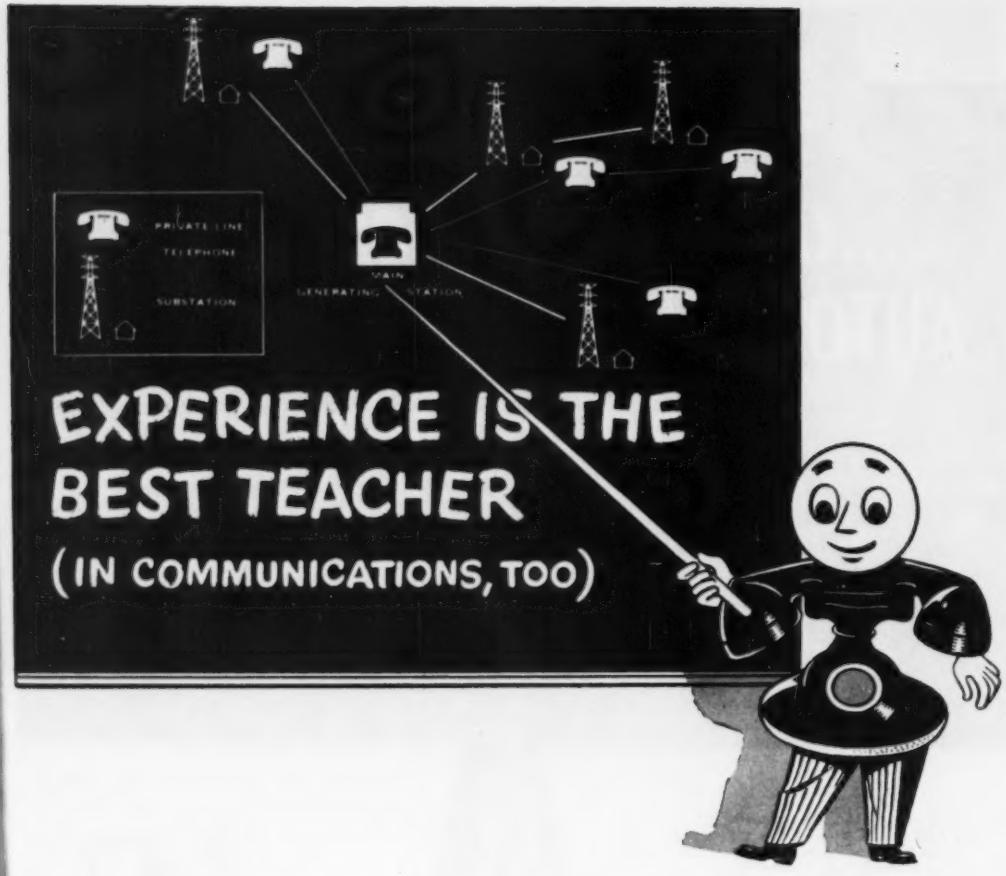

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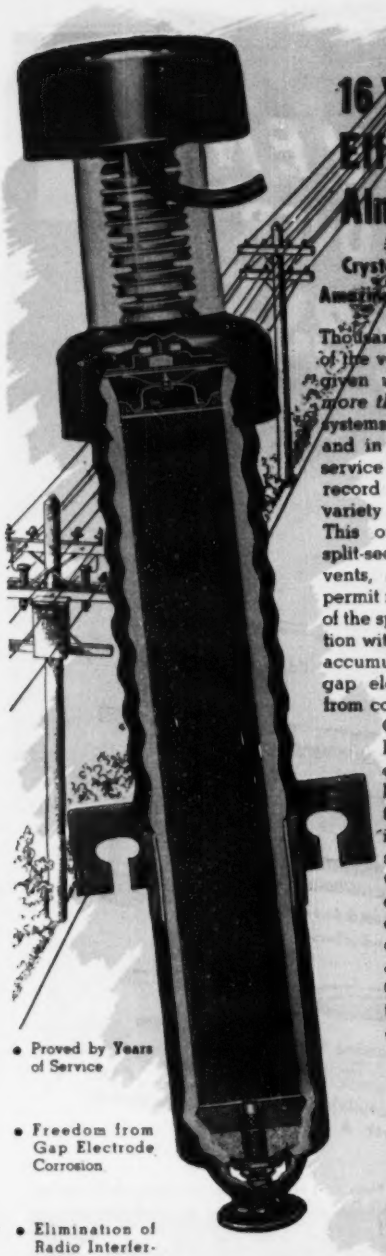

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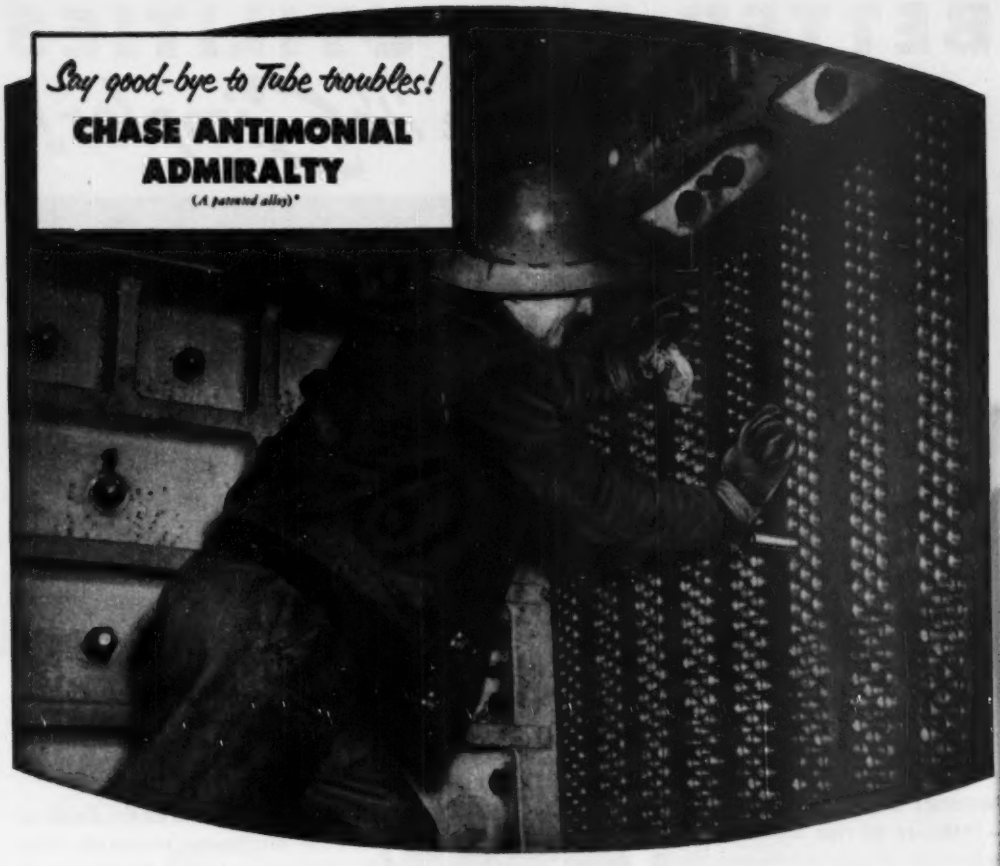

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MICROWAVE

Streamlined Circuitry and Fewer Tubes Provide Greater Economy and Dependability!

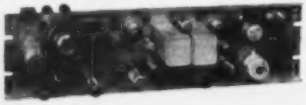
SIMPLICITY . . . that's the basis for the greater efficiency, reliability and economy of maintenance of Federal Pulse Time Modulation Microwave . . . for radio relay systems of any size, type or length . . . over any terrain.

Through *simpler* equipment—requiring *fewer* tubes—Federal PTM successfully meets all needs of telephone, teleprinter, telemetering, remote and supervisory control, VHF mobile radio and other services . . . for complete, simultaneous, dependable, all-weather voice and signal facilities.

Get the facts about Federal PTM's system-wide superiority and proved performance . . . about Federal's more than 20 years of experience in microwave engineering, planning and installation. Write today to Dept. 000.

Federal PTM Delay Line
—"Heart of the System"

Remarkably compact and efficient . . . *has no tubes*. Maintains absolute synchronization between channels . . . provides non-shifting channel selection . . . eliminates crosstalk.



Federal PTM Pulse Generator

Supplies synchronizing pulse to delay line for simple, automatic channel synchronization, eliminating elaborate individual channel tuning provisions. Uses *fewer* tubes . . . greatly increases system dependability.

Simplest in the Field!

Federal PTM

Modulator and Demodulator

Outstanding for minimum-tube design and interchangeability. Plug-connected for ready maintenance . . . greater economy in stocking of spare parts.

HERE are some of the Federal PTM multiplex elements that demonstrate the Simplicity of Design that makes Microwave by Federal—

"Microwave at its BEST"

Federal PTM Pulse Restorer

A valuable insurance factor in longer systems. Automatically cuts in and converts repeater into temporary terminal if adjacent repeater fails . . . maintains communication over remainder of system.

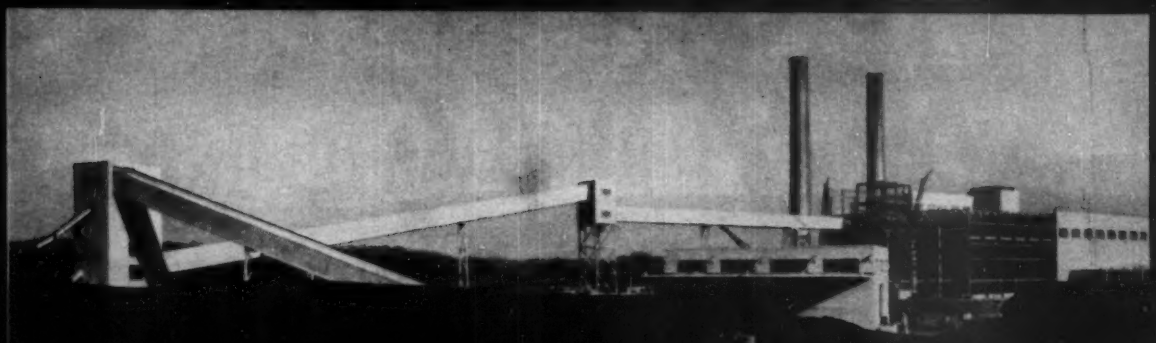
MICROWAVE MOVIE: Be sure to see Federal's new 16 mm. sound-color motion picture *"Microwave Communications for Power Utilities."* Prints shipped without charge for company personnel or organization showings. Write to: Film Distributing Dept. H-717

FEDERAL TELECOMMUNICATION LABORATORIES, Nutley, N. J. . . . . a unit of IT&T's world-wide research and engineering organization.

Federal Telephone and Radio Corporation

WIRE AND RADIO TRANSMISSION SYSTEMS DIVISION
100 KINGSLAND ROAD, CLIFTON, NEW JERSEY

In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P. Q.
Export Distributors: International Standard Electric Corp., 67 Broad St., N.Y.



Bartlett-Snow coal handling at Dayton

The view above shows the first 120,000 KW unit of a plant which will be extended into a 360,000 KW station. The track and reclaiming hoppers, apron feeders, the three 700 ton per hour belt conveyors that total 1,178 feet in length, gates, chutes, and transfer points were detailed and fabricated in our shops and installed by our erectors to Ebasco Services Incorporated's specifications. For maximum efficiency and fixed unit responsibility, let the Bartlett-Snow coal handling engineers work with you on your next job.

DESIGNERS ENGINEERS

BARTLETT-SNOW CLEVELAND 5, OHIO

FABRICATORS ERECTORS

"Builders of Equipment for People You Know"

General View of O. H. Hutchings Station
Dayton Power and Light Company
Ebasco Services Incorporated
Consulting Engineers

Gates and Apron Feeders Under Track and Reclaiming Hoppers

Drive For 700 Ton Per Hour Belt Conveyor

DOWN IT GOES New 500-kva G-E standardized network transformer being lowered into vault on Snow Street, Providence, Rhode Island. Vault previously housed a standardized 300-kva unit.

Load growth in Providence easily met by network system

New 500-kva G-E network transformer nearly doubles the capacity at this location as it replaces a 300-kva unit . . . using the same vault and cable connections.

In city after city secondary networks continue to demonstrate their flexibility and economy for meeting today's load growth—on an orderly, step-by-step basis—without any rearrangement of secondaries or service entrances.

Providence, Rhode Island, provides a recent example. Load in the business district around Snow Street was climbing, due to increasing use of air conditioning, higher levels of illumination and general business expansion. Narragansett Electric, the utility, foresaw the need for additional capacity and simply ordered a new 500-kva General Electric standardized network transformer.

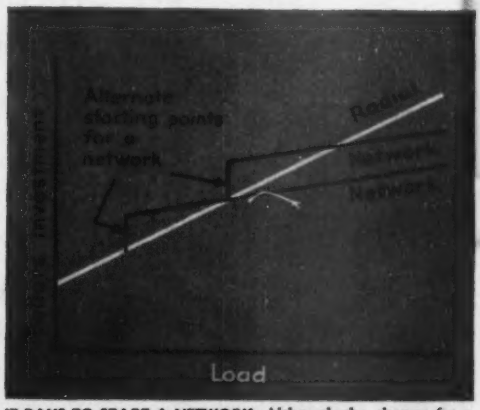
TRANSFORMER EASILY INSTALLED When the new unit arrived, it was placed in storage until actually needed. Then, utility crewmen removed the existing 300-kva unit and lowered the new 500-kva unit into the vault. It was tapped in on the secondary grid without interrupting service.

And that's all there was to it! Since both units were standard, no trouble was encountered in replacing the 300-kva unit with a 500-kva unit—the same vault and even the same cable connections were used!

HELP FOR YOUR SYSTEM If you're struggling to accommodate new loads by perpetuating a radial system and your load density has risen to approximately 10,000 to 15,000 kva per square mile, it may be time for you to investigate the flexibility and economy of a secondary network.

For help in solving your network problems and for complete information on the advantages of G-E standardized network units, see your local G-E Apparatus sales representative. Or write for Bulletins GEA-5024 and GEA-2017. General Electric Company, Schenectady 5, New York. 402-127

HELD IN STORAGE Narragansett Electric, Providence, Rhode Island, foresaw need for additional capacity and ordered new 500-kva unit which was held in storage until needed. With the new unit on hand, utility crewmen were able to schedule its installation well in advance.



IT PAYS TO START A NETWORK. Although the change from a radial to a network system means some initial expense, future increases in capacity require less investment with a network. And with a growing load, the sooner the network is started, the lower the ultimate cost.

GENERAL ELECTRIC

KERITE
CABLE-GRAM
THERE'S AN IMPORTANT DOLLAR DIFFERENCE BETWEEN SERVICE AND MAINTENANCE: THE MORE SERVICE THE SELLER PUTS INTO HIS PRODUCT THROUGH QUALITY MANUFACTURE, THE LESS MAINTENANCE TIME AND EXPENSE THE BUYER HAS TO WORRY ABOUT.
THE VALUE AND SERVICE LIFE OF A PRODUCT CAN BE NO GREATER THAN THE INTEGRITY AND CRAFTSMANSHIP OF ITS MAKER.

DAYS KERITE

KERITE CABLE

THE KERITE COMPANY
30 Church St., N. Y. 7, N. Y.
Offices also at 122 Michigan Ave., Chicago;
582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.

Gamble, Challenge, or Opportunity?

Are utility engineers taking a big gamble today in applying aluminum to distribution circuits? We don't think they are, and we didn't think so five years ago when we published a special issue on aluminum (Sept. 13, 1947).

But regardless of whether aluminum for distribution is a gamble offered, a challenge to be accepted, or an expedient forced on the industry, the risk is not large. Certainly it is not so impressive as many others, the taking of which has driven the cost of power lower over the years.

True there are some elements of risk involved whenever an industry as basic to the public welfare as the electric utility is compelled by circumstances to switch quickly away from a conductor of choice in a key area of its system.

Potentially there is much of value at stake in terms of reliability of service—and public approval that goes hand-in-hand with it—if technical problems inherent in the switch are not solved successfully. On the other hand, there is much to be won in terms of technical and economic flexibility if solution of these problems brings a freer choice between the basic conductor materials.

Basically the technical problems in the application of aluminum are of two types. One group is concerned with physical, chemical, and mechanical problems of applying the light metal to an unfamiliar area of the system. Most pressing of these is development of a splicing technique and a covering method that will overcome conditions inherently antagonistic to use of aluminum with copper, in the presence of air, moisture, and contamination.

The second group of problems concerns the choice of distribution applications into which aluminum is extended. Here it behooves both users and producers to adopt a sane approach. If sound engineering and realistic economics are not used, if a logical program of step-by-step selection is not adopted, and if enthusiasm replaces reason, dangerous misapplications may be made.

The widespread preoccupation of distribution engineers today with the trial application of aluminum to distribution is the healthy reflection of a determination to tackle the application of aluminum as a technical challenge not as a gamble.

Edison Electric Institute's Transmission and Distribution Committee has already taken the essential step of assigning a committee to gather data and suggest a direction for research in the tricky problem of connections. It is to be hoped that when this program takes direction and form, individual distribution engineers will continue to tackle the problems each in the research laboratory of his own system.

Although the connector problem comes first, others need investigation. They include: Optimum temper for wire and cable; realistic standards for stringing tension in aluminum primaries, secondaries and services; better knowledge of thermal loading characteristics of underground cable as well as an evaluation of the most promising areas for application of aluminum in distribution.

If the challenge of these problems is accepted, there will be no gamble.

Obstacles, Not Reasons

No one ever bought a kilowatt hour on impulse. Of itself, the kilowatt hour lacks buyer appeal. Each one is exactly the same as every other one. It is impossible to bring out new model kilowatt hours, sleeker in design, incorporating added features, to attract interest and incline the prospect to say, "I like it, I want it, I'll buy it."

The kilowatt hour is bought because something else was sold first—an appliance, a lamp, or other device that requires electricity to operate it. The kilowatt hour is in second place. It follows along in a market that other things have made for it. It is doomed like a dog to heel to its master.

Of recent years, it seems that electric utilities are more and more getting like their product in respect to selling. Just as the kilowatt hour must wait to be bought until something else is sold; so the utilities appear to be willing to wait for that selling to be done by others. Not all of them, but many, too many. Because it is without intelligence, has no mind, the kilowatt hour can be forgiven for doing nothing about selling, for being content to wait to be bought. But it is harder to understand why so many utilities are taking on a like complacency when they have so much to gain by aggressive selling.

Selling electrification to all of America—industry, agriculture, commerce, and the home—is a job that requires the effort of the whole electrical industry. It will not be done so fast or so well as it can be if one segment of the industry sits back and waits for business to come to it instead of going out and doing its full share of the selling job.

There are reasons why the electric utilities are not in there pitching on this big selling job. To most utility men they are good and sufficient reasons. But to some of them and to the industry at large they are not reasons at all. They are only obstacles to be got around, climbed over, or blasted out of the way. This is the kind of thinking that will prevent the electric utility from becoming exactly like its kilowatt hour in having no sense of selling.

Win the Citizen to Your View

Those who heard Sen Wallace F. Bennett's speech before the Edison Electric Institute convention are still amazed. To hear a business man and past president of the National Association of Manufacturers apparently support government waste was to say the very least an uncommon and unusual experience.

Specifically, Bennett said, "You say the government is wasteful. Oh, what of it? What we waste, actually increases and hastens the process of consumption. You say the government is extravagant. Government can't be extravagant, because its resources are limited to the resources of all of the people, and as long as there are unmet needs, it is our obligation to take those resources and attempt to meet those needs."

In giving us this bit of senatorial philosophy Bennett was not only speaking for himself but as an interpreter of the attitude of Congressmen. He went on to say that taxes, "not only pay our bills, but they give us an instrument by which we can reshape the pattern of life in this country more nearly to our conception of what the majority of the voters want." There are many more quotations from the speech (extracted EW, June 16, p 112) that we could repeat to illustrate this amazing revelation of the mind of a Congressman whose final reward is in votes. But these will illustrate our point.

The lesson that we who disagree can learn is stated quite clearly by Senator Bennett. "The court of last resort is the individual citizen; and if you have a point of view which is more worthy than that of the men who make their living in government, then you can win the citizen to your view."

A Prophecy Is Coming True

Remember "The Story of Ten Little Free Workers," which was the theme of a 1949 advertisement of Potomac Edison Co. If you have forgotten it, you can refresh your memory by rereading it on Page 46 of the Jan. 16, 1950 issue of Electrical World. This was when EW hailed this production of C. D. Lyon and D. H. Fahrney as the "ad of the year." The story told how the government took over various industries and professions beginning with the electric utility and continuing through the medical, railroad, mining, steel, and finally ending up by taking over the press.

The ad was widely reprinted. But many of those who read it were unconvinced of the soundness of Lyon's predictions. Now three years later let us look at what has happened. The electric industry is still holding its own, still fighting, but federal projects are providing a substantial amount of the nation's power. Bills have been introduced in Congress to socialize medicine. The railroads have been under government control. The president seized the steel industry illegally. And he didn't hesitate to infer that he could take over the press.

Three years is but a short time. But it is a long enough time to put four of the other little free workers on the firing line. How much longer will it take for the other five to join them?

America's Wealth

The simple story of how capitalism and free enterprise work to the advantage of everyone is told in "America's Wealth." This 48-page, illustrated booklet by Harold G. Moulton of the Brookings Institution is based on the author's book "The Dynamic Economy."

With outstanding illustrations and written in simple, clear style this booklet fills a big gap in the field of publications on the American system. It provides material above the comic book level, appropriate for the young adult or the mature thought leader. Both will find it informative and interesting.

The booklet "America's Wealth" is recommended for summer reading.

Political Conventions a Reminder

The political conventions taking place this month should remind the industry of one thing—Now is the time to start a "Be Sure to Vote" campaign. The best candidate in the world running for the presidency on the soundest of platforms will get absolutely nowhere unless he is supported by the votes of the majority of those Americans interested enough to cast their ballots. It is only good citizenship for electric companies to encourage their employees, regardless of political affiliation, to vote. It is also proof that the industry believes in the "American Way."

THE ELECTRICAL WEEK

Featured in the News

Congress refuses to approve funds for four new hydro projects, but cuts little from other federal power appropriations (p 116) . . . President takes another swipe at the private companies in promising federal development of power at dedication of Bull Shoals and Norfork Dams p 117) . . . Utility-industry teams are cautiously optimistic that atomic power plants can develop electricity economically (p 118) . . . American P&L will dissolve in accordance with plan the company is readying for submission to SEC (p 120) . . . Connecticut L&P is looking for ways to solve its Cove Island power site problem (p 122).

• • •

Latest from Washington—Congress votes $2.9 billion for atomic energy plant expansion thus clearing way for construction of proposed Ohio Valley gaseous diffusion plant . . . TVA board of directors attain full strength as Senate confirms Raymond Ross Paty, southern educator, to fill vacancy of three-man board . . . FPC votes to permit Interior Secretary Chapman to intervene in hearings on application of Idaho Power Co for a license to build and operate the Oxbow project on Snake River. Hearings on Oxbow begin today at Baker, Ore. . . . Senate shelves a House-passed resolution to change name of Bonneville Power Administration to Columbia Power Administration . . . Because it has no jurisdiction in the cases, FPC had dismissed merger applications of four Potomac Edison Co subsidiaries . . . REA approved 20 electrification loans totaling $7,250,000 during last week of June, which was final week of government's fiscal year. Largest of these loans went to Southeast Colorado Power Assn, which borrowed $2,250,000 to build 973 miles of distribution and 67 miles of transmission lines.

Republican National Convention—Former President Herbert Hoover told delegates "If you want to see pure socialism mixed with give-away programs, take a look at socialized medicine and socialized electrical power."

From East South Central—Madisonville, Ky., City Council awards contract to Cosper, Townsend & Associates, Chicago, to make a survey for a municipal system. Council considers rates of Kentucky Utilities excessive.

From West North Central—Eastern Kansas Utilities stockholders approve sale of southern portion of its properties, including those in Fort Scott, to Kansas G&E for $2.8 million. They also voted to liquidate and dissolve EKU (14,000 meters). Northern portion of system will be transferred to Kansas City P&L. FPC has approved the acquisitions. Transactions will probably take place this month . . . Houston, Mo., will take over properties from Sho-Me Power Corp on July 17.

From the Far West—In view of condemnation suits now facing Puget Sound P&L, President Frank McLaughlin says he cannot carry out the construction program suggested in a report prepared by Stone & Webster Engineering Corp. The report calls for 110,000 more kw of capacity. The kw-year cost of power is estimated at $14.50 versus $17.50 now charged by Bonneville Power Administration. PUD representatives say that while the districts are not definitely committed to making proposed expansion, report would be welcomed as a guide in their development programs.

Construction—Rochester G&E buys property in Rochester to install a drive-in-system to allow customers to pay bills without leaving their autos . . . Seattle City Light is planning $4.5 million hydro plant in Duwamish area.

Financial—Central Illinois PS common stock was admitted to trading on New York and Midwest (Chicago) Stock Exchanges on July 9 . . . Illinois Power Co asks Illinois Commerce Commission approval to acquire White City municipal electric distribution system . . . New financing by electric companies in first six months of 1952 totaled $1.1 billion, a record high, as compared with $783.7 million in 1951, EEI reports in preliminary statement. It also reports Class A&B electric companies' net income totaled $460 million for first six months of 1952 versus $420 million in 1951 and $438 million in 1950.

Labor—Chicopee, Mass., Municipal Lighting Department agrees to give employees 8% pay increase . . . IBEW-AFL has agreed to defer until July 17 a strike against New Brunswick Electrical Power Commission if no settlement is made . . . Public Service E&G's maintenance employees at its home office in Newark get 7½% pay boost and adjustments in 14 job classifications.

Rates—Niagara Mohawk Power asks NY PSC approval to merge five industrial rates into one in Erie and Niagara Counties which will net company about $1,860,000 more annually.

Production for Freedom Theater—"Walls Without Welds," a U. S. Steel Co movie, will be featured Sunday evening, July 20, over most ABC television stations.

Bituminous coal stocks held by electric utilities on June 1 totaled 34,545,000 tons, a 139-day supply, based on May use. Yet coal production lags 9% behind 1951.

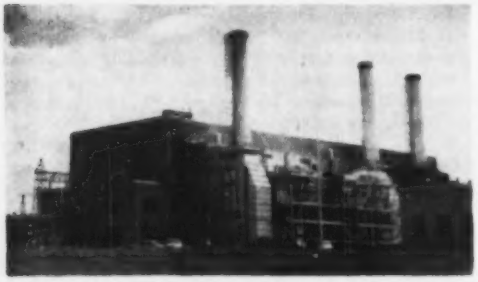
Pittsburgh Consolidation Coal Co has taken out three basic patents on a fuel gas cell for conversion of heat into electricity (dc) with a claimed efficiency as high as 75%.

Babcock & Wilcox Co reports that it has 80 pressurized furnaces installed or on order in U. S., totaling 50 million lb per hour of steam capacity representing a total of 7 million kw. Of the 80, they say, 18 have been installed with over 9 million lb per hour and 1.3 million kw.

Congratulations—A. B. Patterson, New Orleans PS chairman, is new Southern Association of Science and Industry president.

WASHINGTON COMMENT

JESSE MOCK



STANDING IN THE WAY of what people need in this country is the new 105,000-kw Knox Lee Plant of Southwestern Gas & Electric Co, that is if one believes President Truman. In his speech dedicating Bull Shoals and Norfork Dams the President lambasted the power companies for opposing progress and being against the best interests of the people. The president of Southwestern G&E (Frank M. Wilkes) was singled out by the nation's chief executive for a special attack because of his testimony before Congressional committees against the socialist schemes of those who would expand federal power generation

Two statements on electric power development which have come out of the White House recently present an interesting contrast in tone. One was the dedicatory speech which President Truman delivered July 2 at Bull Shoals Dam, Arkansas. The other was the statement of the President's Materials Policy Commission.

A careful study of the two statements reveals some differences in approaches to electric power expansion, but the main difference is in the emphasis supplied for the campaign oratory and the appraisal made by the commission.

Antagonism versus Reason . . . For instance, the President at Bull Shoals gave the impression that the power companies have contributed little if anything to the public good: "Sooner or later the private power companies are going to find out that they cannot stand in the way of what the people need in this country. And the sooner they find it out, the better it will be for everybody concerned."

Now take a look at the commission report, "Private industry produces 85% of the nation's electric energy supply (70% by private utilities and 15% by industrial concerns) and has been responsible for most technical advances during its 70 years of growth."

Or take this charge in the Bull Shoals speech, "You know all these special interest lobbies are ganged up together to work against the public interest."

Then the President's commission: "It is expected that private utilities can and will provide most of the expansion the nation will need, especially for thermal generation, but government will have continuing large responsibilities of the sort presently handled, and especially for developing electricity from waterpower sources."

Truman took an indirect swing at power companies for opposing government financing of a steamplant in Arkansas. But the commission found "private enterprise is well equipped to carry the main burden (of thermal power expansion).

No Conciliation . . . Nowhere in the Bull Shoals speech is there a conciliatory tone toward the power industry. Nowhere is there an offer of cooperation. Yet the President's commission just a few short days previous to the speech made this recommendation:

"To enable private utilities to expand and advance technology, it is obviously important that all related government policies—federal, state, and local—should be shaped to provide conditions favorable to intensive technological research and development and to capital expansion, balanced with full protection of the consuming and investing public."

The Materials Policy Commission says the federal government will have to continue to develop hydroelectric sites where multipurpose development of a river basin represents the best approach, but it adds: "There will be cases where part or all the job can be handled by private business, particularly where a site can be developed best on a single purpose basis, or where private industry and government can collaborate in a multipurpose development."

On fundamental policy, there is much less contrast. The President is asking for no great change in basic federal power policy. The commission believes there will be none within the next 25 years. But the President's speech was marked by its antagonism toward the power companies while the commission urges avoidance of controversy between public and private power interests. Concludes the commission, "Protracted controversy will only contribute to power shortages and higher energy costs."

TECHNICAL NOTES

ARCHER E. KNOWLTON

Network protectors so infrequently develop troubles that dependence can be placed on a supervisory system rather than on periodic inspection.

Detergents and soaps are not good for polyethylene whether as means for testing for cable sheath leaks or for duct lubrication. They tend to make the polyethylene crack under moderate strain conditions.

Communication system for a power plant should seldom cost as much as $1 for each $2,000 spent for the plant as a whole.

Xeroradiography produces fast, dry-process, positive X-ray images by resort to low-cost powders and reusable plates.

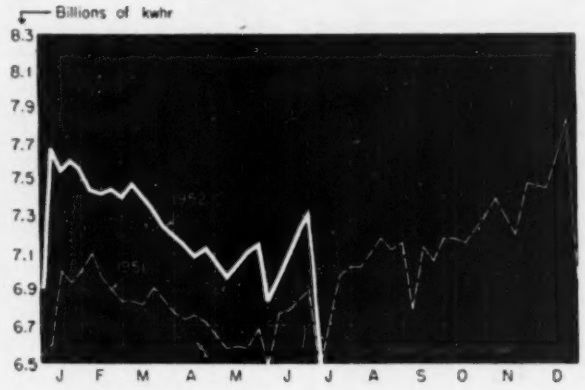
Linear couplers are used on the high tension bus of three stations among 21 surveyed.

Stalpeth sheath will ultimately supersede Alpeth for telephone cables. It has a corrugated terne-coated steel tape between the aluminum and the polyethlene of Alpeth.

Cable sheath for the 70,000,000 miles of Bell System circuits aggregates 300,000 miles.

Coil temperatures in electronic equipments have been upped 25 degrees C by insulating the wire with nylon and the coils with asbestos.

STATISTICS



Output Week Ended July 5—6,452,959,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
July 5	+6.2	+9.5	+1.5	+1.7	+10.0	+13.8	+14.9	+6.3	+3.3	+3.4
June 28	+6.1	+3.1	+1.7	—0.6	+10.0	+14.7	+18.9	+8.3	+6.1	+3.7
June 21	+6.1	+1.6	+3.4	—2.0	+6.9	+14.6	+19.8	+10.4	+7.7	+5.3

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	Apr.	64.8*	66.5	60.4
Capacity (Million Kw)	May	77.01	76.74	71.35
Production (Billion Kwhr)	May	31.82	31.51	29.87
Hydro		9.69	9.96	8.54
Fuel		22.13	21.55	21.33
Fuel Consumption				
Coal (Million Tons)	May	8.01	8.05	7.99
Oil (Million Barrels)		3.72	4.20	4.51
Gas (Billion Cu Ft)		76.99	66.50	70.57
Sales (Billion Kwhr)	Apr.	28.33	29.03	26.68
Residential		7.91	8.32	7.12
Commercial		4.74	4.85	4.39
Industrial		13.85	13.98	13.17
Other		1.83	1.87	2.00
Net Income Class A & B Companies ($ Million)	Apr.	75.82	82.84	70.66
Estimated Dec. 52 Peak (Million Kw)	Apr.	80.3	80.4	78.7
Kwhr per Residential Customer (12 Month Average)	Mar.	2,053	2,037	1,882
Revenue per Kwhr Residential Service (12 Month Average)	Mar.	2.79¢	2.80¢	2.86¢
Canadian Production (Billion Kwhr)	Apr.	5.03	5.22	4.90

Business Statistics

FRB Industrial Production Index†††	May	214	215	223
Gross National Product Annual Rate ($ Billion)	1stQtr.	339.0	334.6	319.5
E. W. 5 Industry Production Index	May	116.8	118.8	122.0
ENR Construction Cost Index††	June	117.8	116.8	113.7
BLS Consumer's Price Index	May	189.0	188.7	185.4
NEMA Insulation Materials, Sales Index†	Apr.	545	536	626
NEMA Electric Appliance Sales Index†	Apr.	221	278	326
NEMA Household Refrig. Sales Index†	Apr.	133	163	242
Metal prices (July 7)				
Copper, Conn. V., lb		$ .24½	$ .24½	$ .24½
Lead, N. Y., lb		.16	.15	.17
Zinc, prime Western E. St. Louis, lb		.15	.16	.17½
Tin, Straits, qual. N. Y., lb		1.21½	1.21½	1.06
Aluminum, ingot, base price		.19	.19	.19
Nickel, base price		.56½	.56½	.56½
Steel, billets, Pitts., ton		56.00	56.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	45.00

* Estimated. † 1936=100 †† 1949=100 ††† 1937-39=100 (Unadjusted)

Industry's Top Buyers of Electrical Energy

During 1951 the nation's manufacturers were asked, "How much electricity did you purchase during 1950?"

Data from the "Survey of Manufacturers," recently released by the Bureau of the Census, reveal that the total purchased by all manufacturing establishments was $1,228,460,000.

Largest purchase, by an industry group, was made by the plants of the primary metals industry, $251.9 million. This was 20.5% of the total.

Second largest purchasers were the nation's food processing plants. These bought $136.2 million, 11.1% of the total.

Listed here are the purchases of the manufacturing establishments during 1950. These are classified into 20 industry groups.

Electrical Energy Purchased By Manufacturers—1950

Industry Group	$ Million	% Total
Primary Metal Industries	251.9	20.5
Food & Kindred Products	136.2	11.1
Chemical & Allied Products	117.1	9.6
Textile Mill Products	104.1	8.5
Machinery (except electrical)	81.5	6.6
Transportation Equipment	77.4	6.2
Stone, Clay & Glass Products	72.8	5.9
Fabricated Metal Products	69.2	5.6
Paper & Allied Products	61.2	4.9
Electrical Machinery	44.1	3.6
Petroleum & Coal Products	36.1	2.9
Lumber	31.9	2.6
Printing & Publishing	28.8	2.4
Rubber Products	27.9	2.3
Apparel	26.7	2.2
Furniture & Fixtures	17.1	1.5
Leather	9.9	0.8
Instruments	8.3	0.7
Tobacco Manufactures	2.6	0.2
Miscellaneous	23.6	1.9
Manufacturing Establishments of All Industries	1,228.5	100.0

Purchases of the five top industries are over 56%, of the top ten over 80%.

Purchases of electric energy by industry during 1947, year of the preceding census, totaled $954,717,000. The increase in three years, therefore was 28.7%.

In 1947 plants of the metals industry purchased $188.8 million or only 19.7% of the total. Food processing establishments purchased $108.5 million or 11.3%.

Revenue received during 1950 by the nation's electric utilities from customers in the large light and power classification, as reported by the Edison Electric Institute, was $1,404,979,600, during 1947, $1,106,555,100.

4 Dams Out, but Power Budget Is Big

How Congress Trimmed Construction Funds for Federal Power Projects:

AGENCY	President Requested (Millions of Dollars)	Congress Approved (Millions of Dollars)
Interior Department		
Southeastern Power Adm.	$ 6.35	$ .95
Southwestern Power Adm.	4.15	4.15
Bonneville Power Adm.	70.28	66.52
Bureau of Reclamation	194.72	177.79
Army Corps of Engineers	659.99	584.06
Tennessee Valley Authority		
Regular Appropriation	200.02	186.02
Supplemental Appropriation	150.00	150.00

Congress, in throes of adjournment last week, turned a final thumbs-down on all four of the new hydroelectric projects President Truman proposed to get underway during the current fiscal year.

But except for some trimming around the edges and lopping off of several controversial requests for funds, the remainder of the President's power budget was treated less roughly (see table).

Early Consideration . . . Despite a last-ditch floor fight for some $4 million to begin construction on the Hartwell Dam in Georgia, House-Senate conferees agreed only to give the request early consideration when Congress meets again. Ice Harbor Lock and Dam was in the same category. The Senate had approved funds for both these projects, but the House refused to go along.

Two other proposed new hydroelectric projects failed to receive Congressional authorization, and hence were not eligible for construction funds. These were the St. Lawrence Seaway power project, which the Senate shelved, and the Hells Canyon project on the Snake River in Idaho, which was pigeonholed by a House Interior subcommittee.

Instructions to Interior . . . Interior Department was again urged to keep federal construction of transmission lines to a minimum, and directed to negotiate transmission contracts with power companies whenever possible.

In appropriating $959,500 to Southeastern Power Administration for construction of the Clark Hill Dam-Greenwood (S. C.) line and planning of a similar line in Florida, Congress made this stipulation:

"Provided, that no part of the funds appropriated by this paragraph . . . shall be available for construction of transmission lines and related facilities in the Southeastern Power area until (1) a contract with the affected power companies in the area of substantially the type which has heretofore been executed in other power areas for system-wide transmission of electric power and energy from government-owned projects to preferred customers has been executed, or the said companies have refused to execute such contracts, and (2) Secretary of Interior has so informed the Congress."

House-Senate conferees on the Interior funds bill also expressed hope that the power interchange contract now being negotiated between 12 power companies in the Southwest area and Interior Department "can be consummated at an early date and in a manner that may make unnecessary any further litigation."

Line Requests Rejected . . . Congress flatly rejected Interior's request for funds to construct a number of other transmission lines. Among those struck down by Congress were:

- All of those proposed to transmit power from Kerr Dam (formerly Buggs Island) to points in North Carolina and Virginia.
- The Baker-LaGrand line requested by Bonneville Power Administration.
- The California-Oregon intertie.
- The Yellowtail-Billings line, the Sioux City-Omaha line, and the Minnesota line all in the transmission division of the Missouri River basin project. For the controversial Minnesota line (EW, March 17, p. 6), House Appropriation Committee members twice refused to provide funds. The first request was made in the Interior appropriations bill.

House Concurs . . . House members did go along with the Senate on two important increases for large power projects. These were the Dalles Dam, in Oregon, for which $20 million was appropriated, and Gavins Point Reservoir in Nebraska, for which $7.7 million was appropriated.

Also deleted from the President's budget were funds for an Interior Department study of electric power and energy in New England and New York. Congress voted $100,000 for further government planning and study of the Niagara power redevelopment project.

Funds for TVA . . . On the Tennessee Valley Authority appropriations, the Senate restored $14 million which the House had deleted for two steam units at the Shawnee Plant. The House had originally knocked out funds for all the four new units proposed for Shawnee. With little argument, both houses quickly approved a supplemental $150 million requested for TVA in connection with atomic energy plant expansion.

THE PRESIDENT cuts ribbon to open roadway across Bull Shoals Dam at Mountain Home, Ark. This and Norfork Dam, which he also dedicated, will supply more than 230,000 kw to the area. With the President are State Rep J. W. Trimble; Treasury Secretary John Snyder; Lt. Gen. Lewis A. Pick, chief of Army Engineers; and Arkansas Gov Sid McMath

Promises Federal Development

President, dedicating Bull Shoals, says government must go ahead on hydro plans despite industry's opposition

President Truman used the July 2 dedication of Bull Shoals and Norfork Dams in Arkansas to take another swipe at private power companies for opposing federal development of hydroelectric projects.

With a tremendous power demand predicted for the next 25 years, the President said, the federal government must develop hydroelectric power at every site where it is feasible.

"We cannot let our development programs be stopped by the private power lobby or any other selfish interest," he asserted.

Industry's Answer . . . Bayard L. England, President of Edison Electric Institute, immediately replied the industry was "perfectly capable" of providing electric power for the foreseeable demand without government competition.

"Let the enterprise system work," he commented, "and we'll provide the kilowatts for a strong and prosperous America without benefit of government subsidy."

The speech Truman made was frankly political. He told his audience: "I know the New Deal and the Fair Deal have done more for the South than any other national administrations in this country's history."

Progress in the South, he said, has come about because of the Tennessee Valley Authority and public projects such as the two large multipurpose dams he was dedicating.

"You people in Arkansas and Missouri know how hard you had to fight to get these dams built," he said. "Bull Shoals and Norfork were opposed, bitterly opposed. . . . There were some private power companies in this area who thought that nobody should be allowed to produce power but themselves. . . . They fought against these dams for years."

Points Finger . . . He named Arkansas Power & Light Co and Southwestern Gas & Electric Co as chief opponents of Bull Shoals and Norfork.

AP&L, he said, built an expensive working model of a dam to try to prove you could not have flood control and power at the same time.

Pointing to the two dams as refutation of this argument, the President said, "The company carted that thing all over the State of Arkansas, trying to fool people. They didn't fool anybody but themselves."

When asked to comment on Truman's remarks, C. Hamilton Moses, president of Arkansas P&L, said merely, "I do not want to make any reply to the President of the United States."

The president of SG&E, said, told a Congressional committee the dams would be a method toward Truman socialization of the electric industry.

"That's what they say about a lot of things the government is doing these days. . . . Every time we try to do something for the people, some special interest pops up and yells 'socialism'. That's what has happened here."

Reached in Shreveport, La., after the speech, Frank M. Wilkes, SG&E president, said, "I'm just very proud that the President of the United States would take the time to kick me in the seat of the pants."

The President, he said, had lifted out of context a statement he had made to a Congressional committee.

"I will say this: Government in any business is socialism. The government is trying by encroachment to take over the private power companies piecemeal—we object to them taking over our property, that's all."

Co-op Fight . . . The private power companies in the Arkansas-Missouri area, Truman charged, were trying to stop the farmers from getting the benefit of low-cost hydroelectric power through their electric cooperatives.

"And why are they doing that? I'll tell you why. It is to try to make the farmers pay more for their electricity. It's as simple—and shocking—as that."

The President promised to do all he could to have the federal government develop water resources all over the country, since by 1975, he pointed out, the nation will need 2½ times as much electric power as is produces today.

In his statement replying to the President's talk, England said a whole new electric power industry had sprung up in the last ten years to meet the country's every need for defense and an expanding civilian economy. That industry he said, already was thinking in terms of a trillion kwhr by 1970.

"This was done at no cost to the taxpayer," he commented. "With this charting for the future, government spending for competitive electric installations is wholly unnecessary."

Atomic Power Plants Are Feasible . . .

. . . four industry-utility company teams believe. Experts are optimistic nuclear energy can be turned into salable electricity

For the past year, four industry-utility company teams have been pecking away at the question: Can atomic energy be turned into commercially marketable electric power?

With final reports in but still locked away in the files of the Atomic Energy Commission, the answer appears to be a tentative "yes". All four teams are cautiously optimistic that a feasible nuclear-fueled electric power plant can be developed. Each team also proposes that its studies be continued at a higher engineering level.

Continue Studies . . . One of the groups—consisting of Detroit Edison Co and Dow Chemical Co—already has an AEC okay to go ahead to the second phase of its study (EW, May 5, p 78). Researchers from these two companies are continuing their studies at Midland, Mich., and will spend an estimated $250,000 during the twelve months which began last April.

Another team—Monsanto Chemical Co and Union Electric Co of Missouri—is apparently chomping at the bit to get started on the second phase of its studies. In a recent speech, a Monsanto official disclosed this study team had recommended that AEC design and build a pilot plant for a moderated type of atomic reactor. The scientific team of the two companies is ready to begin preliminary studies and work on the proposed plant to make sure the technical theories are correct.

Considers Recommendations . . . AEC is still considering the recommendations of the Monsanto-Union Electric report along with those from two other groups, Pacific Gas & Electric Co-Bechtel Corp, and Commonwealth Edison Co-Public Service Co of Northern Illinois.

Spokesmen describe the reports as "raw material" which the commission must evaluate and decide whether further study is merited. Although one commissioner has expressed the hope that carefully edited versions of these reports may eventually be released to the public, this is still problematical.

Guards "Trade Secrets" . . . Besides the security material in the reports, AEC also is guarding the various "trade secrets" developed by the separate teams. However, the commission approved the report synopsis released by Monsanto and probably would do the same for any other team that cares to disclose its findings.

Monsanto's proposed power plant would simultaneously manufacture plutonium, which would be sold to the government.

Rep Henry M. Jackson, a Washington Democrat and member of the Joint Atomic Energy Committee, is backing a proposal for immediate construction of a power-producing reactor. "We must take this whole matter out of the laboratory and into the production shop," says the Washington Congresaman.

He believes that a model power reactor may be constructed for $30-40 million. This would be one that would also produce plutonium along with the electricity needed for a city of 100,000. But, he says, electric power from atomic energy would be useful only in areas where the price of electricity from conventional sources is high.

Sinclair Dam Nears Completion

Work is being rushed on the $16-million Sinclair Dam Georgia Power Co is constructing at Furman Shoals on the Oconee River near Milledgeville. The dam is named in honor of B. W. Sinclair, superintendent of production, and will have two 22,500 kw units installed to go into service at the end of this year. This is the first Georgia Power hydro project since Nacoochee Dam was completed in north Georgia in 1926. When completed the company will have 351,800 kw in hydro capacity and 785,000 kw in steam capacity.

Sutton TV Interview Scheduled for July 16

Louis V. Sutton, president of Carolina Power & Light Co, will be interviewed on private enterprise and the electric industry on "Longine's Chronoscope." The program will be telecast over the CBS network at 11 PM (EDST), July 16.

The "live" show will be carried by Stations WCBS, New York; WAGA, Atlanta; WMAR, Baltimore; WMAL, Washington; and WOI, Ames.

These stations will rebroadcast on July 23: WBKB, Chicago; WMBR, Jacksonville; KNXT, Los Angeles; and KPIX, San Francisco. KRLD, Dallas, will rebroadcast on July 29, and WOAI, San Antonio, will air the program on July 30.

Other CBS stations can carry the "live" show if it is requested or sponsored, or a 16-mm, sound-track kinescope of the program may be purchased for around $35. Further information may be secured from Victor A. Bennett Co, 511 Fifth Avenue, New York 17, N. Y.

POWER BRIEFS

● On the basis of present water supply, power will be more plentiful in the Pacific Northwest next winter than it was last year, Bureau of Reclamation believes. Water supply was termed by the bureau "uniformly good or better" in Washington, Oregon, western Montana, Idaho, and parts of Wyoming. As of June 1 reservoirs behind dams in this area were reported holding the greatest amount of water ever caught and conserved for beneficial use.

● Construction of the Yale Dam has increased the Washington State Tax Commission's evaluation of Pacific Power & Light Co properties within the state from $20.6 million to $30 million.

● The Navy is converting the motor ship Coastal Racer into one of the largest floating power plants in the world. The conversion is being done in Jacksonville, Fla., where three oil-fired steam turbo-generators will be installed in the next two years. Total capacity will be 34,500 kw, 4,500 kw greater than three such plants built by the Navy during the war.

● Columbia University is negotiating with the Atomic Energy Commission for construction of a nuclear reactor for the study of atomic energy on the campus. Columbia wants to set up the reactor primarily for the education of atomic physicists and engineers and for research. Cost of the installation might run from $500,000 to $1.5 million.

● British Columbia provincial authorities have agreed to accept $255,508 from Seattle for all damages to properties from flooding of areas across the international boundary line by Seattle City Light's Ross Dam on the Skagit River. Dam's reservoir will extend eight miles into Canadian territory.

● It took an explosion to put the new $400,000 Dayton Power & Light Co substation, south of Wilmington, Ohio, into operation last month. A switch explosion in the old Wilmington substation on June 8 made it necessary to put the almost completed substation to work prematurely. Most of the Wilmington area was without power for 35 minutes during changeover.

● Wire tapping was getting to be a fairly big business in Alexandria, Egypt, until the police stepped in recently. There a gang of 11 men were tapping the city's electricity cables and selling the current to its own list of subscribers at cut rates. The gang operated from small radio shops to cover their possession of large stocks of wire, used to fit "leaks" from the main cables to houses and shops of their customers.

● Washington and Canadian officials have completed plans to establish anti-aircraft stations on both sides of the power-rich Niagara frontier. Grand Island, above the falls on the American side, is a likely site for two installations. There would be six installations on the U. S. mainland between Buffalo and Lewiston and four in Canada close to industrial and power plants in the Niagara Falls-Queenston area, the officials said.

● Alabama Power Co's Engineering and Construction Department has received recognition from Edison Electric Institute's Safety Merit Award Committee for working 1 million manhours without a disabling injury accident.

● Southern California Edison Co has received the 1951 annual award of the California Fire Prevention Committee for outstanding service toward prevention of forest fires. The company was cited for distributing forest fire prevention information to millions of people.

Power from the Andes Mountains

Water from the snow-capped peaks of the Andes Mountains is utilized at the Abanico power plant near Concepcion, Chile. The picture above shows a view from the top of the spillway with the Abanico Valley in the background. The Chilean government is building six hydro plants to produce 4 million kwhr in the Andes in a large industrialization program.

American P&L Battle Nears End

Company will be dissolved in accordance with a plan which is being prepared for presentation to the SEC

The 43-year old American Power & Light Co will soon come to an end, Pres Howard Aller said in releasing the 1951 annual report recently.

This holding company at one time had assets on a consolidated basis totaling nearly $900 million. At one time, it controlled public utility companies in 13 states in the United States.

Dissolution Near . . . The company will be dissolved, he said, "in accordance with a plan which is being prepared for presentation shortly to the Securities and Exchange Commission."

American's last remaining major subsidiary, Washington Water Power Co, will be disposed of by distributing one share of Washington common stock for each share of American stock. This is in accordance with a plan filed with the SEC and approved by it on June 6, the report stated. A hearing on the plan will be held in the United States District Court in Portland, Maine, on July 17. If it is approved by the court, the distribution of the Washington stock will be made shortly thereafter.

Immediately prior to the distribution, Aller said, American will transfer its interest in Washington Irrigation & Development Co, an inactive company, to Washington. It will also make a capital contribution of $186,000 in cash to Washington.

After Washington's Distribution . . . When Washington's stock has been distributed, American's only assets will consist of its cash and liquid short-term investments and 54,763 shares of Portland Gas & Coke Co common stock, subject to certain undetermined liabilities. As soon as liabilities are determined and discharged, the remainder of the cash available will be distributed to the stockholders, the report said. The first partial liquidating distribution of cash, Aller declared, is expected to be made early in the fall of 1952. This will amount to 95¢ a share.

American will distribute before the end of 1952, the report pointed out, the 54,763 shares of Portland G&C stock to its stockholders. It is sufficient to provide one share of Portland stock for approximately 43 shares of American's stock. Those stockholders whose holdings are not large enough to entitle them to a full share of Portland stock will receive the proceeds of their fractional interests in cash.

Tax Savings . . . The report also pointed out that tax counsel advise that a further result of the rapid amortization of the cost of the Cabinet Gorge plant for tax purposes is that a portion of the dividends paid on the Washington's common stock, in some of the five years, may be considered for tax purposes to be paid from capital, and hence not taxable as ordinary income to the stockholders.

Preparations are being made, the report said, for a resumption of hearings by the regulatory commissions of Washington and Idaho on Washington's applications which have been pending since 1950 for a general increase in the company's rates for service. It is expected that these proceedings will be concluded and a decision reached before the end of 1952.

FINANCIAL BRIEFS

Virginia Electric & Power Co has received North Carolina Public Utilities Commission approval to buy and absorb Hydro-Electric Corporation of Virginia (EW, July 7, p 43) . . . **Florida Railroad and Public Utilities Commission** has ordered private power companies under its jurisdiction to pay 6% interest on service deposits required of its customers.

Stockholders Subscriptions: Pacific Gas & Electric Co stockholders subscribed to 2,219,435 common shares on 1-for-5 basis at $30 a share; balance 51,865 shares placed privately by Blyth & Co group, underwriters . . .

SEC Member?

J. Howard Rossbach, attorney-in-chief of The Legal Aid Society, New York City, has been nominated by President Truman as a member of the Securities and Exchange Commission, replacing Robert I. Millonzi who retired last month.

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Northern States Power Co stockholders exercised rights for more than the 1,108,966 shares offered on 1-for-10 basis at $10.50.

Standard Gas & Electric Co's directors have approved a plan to dissolve. It is subject to satisfactory tax rulings and appropriate approvals for regulatory bodies. Under the plan each share of company's $7 prior preference stock would receive 4.8 common shares of Wisconsin Public Service Corp, 2.9 common shares of Oklahoma Gas & Electric Co, and 2.1 common shares of Duquesne Light Co. Each share of $6 preference stock would receive 4.5 common shares of Wisconsin Public Service, 2.6 common shares of Oklahoma Gas & Electric, and 1.8 common shares of Duquesne Light. Each share of $4 preferred would get 4 common shares of Duquesne Light. Each share of common stock would receive ½ common share of Duquesne Light and ¼ common share of Pittsburgh Railways Co, plus whatever miscellaneous assets and tax recoveries which may be realized.

New York State Electric & Gas Corp will pay Aug. 15 a common stock dividend of 47½¢ a share versus 42½¢ a share in previous quarters.

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1952									
July 3	**2.94**	**3.00**	**3.09**	**4.07**	**4.28**	**4.66**	**5.36**	**5.79**	**6.25**
June 26	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42
2nd 1952	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42
1st 1952	2.95	2.99	3.13	4.11	4.29	4.66	5.35	6.03	6.47
4th 1951	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84
3rd 1951	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months Ended		Net Income 1952	Net Income 1951	Earnings Per Common Share 1952	Earnings Per Common Share 1951
Arizona Public Service	12	May	$2,537,275	$2,067,568	$0.99(a)	$....
California-Pacific Utilities	12	May	509,948	459,786	1.91(b)	1.78(b)
Consolidated Gas Electric Light & Power	5	May	4,624,328	4,708,624	0.84(b)	0.88(b)
Consumers Power	12	May	19,830,848	19,979,816	2.67(a)	2.96(a)
Dallas Power & Light	12	May	3,557,554	3,348,706	....	....
Gulf States Utilities	12	May	6,265,643	5,961,783	1.39(c)	1.66(c)
Pacific Power & Light	12	May	3,959,922	3,234,365	1.60	....
Pennsylvania Power & Light	12	May	13,077,520	11,611,468	2.40	....
Philadelphia Electric	12	April	26,536,110	27,531,264	2.13	2.22
Potomac Electric Power	12	March	5,705,848	4,468,122	1.24	....
Public Service Co of Indiana	12	May	9,117,555	8,290,841	2.34	2.36
South Carolina Electric & Gas	12	May	1,965,668	1,647,325	0.69(b)	0.60(b)
Texas Electric Service	12	May	7,440,544	5,503,324	....	....
Texas Power & Light	12	May	6,785,627	5,502,983	2.40	....
West Penn Electric, Consolidated	12	May	11,752,427(e)	10,996,901	2.96(a)	3.12(a)
			1951	**1950**		
American Power & Light	12	Dec.	$2,126,935	$.....	....	....
Washington Water Power	12	Dec.	3,363,846	3,136,368	....	....

NOTES—The figures for the last two companies have been audited; (a) Based on shares outstanding at end of period; (b) Based on average number of shares outstanding; (c) Based on 3,124,168 shares in 1952 and 2,884,390 shares in 1951; and (e) Before special tax adjustment reduction of $110,600 due to amortization of certain facilities under necessity certificates issue by the Defense Production Administration.

FINANCING

Company and Description	Amount of Offering ($000)	Offering Price	Yield to Public
WEEK OF JULY 3-9			
Bonds			
Georgia Power—1st mtg 3¼% 1982	$20,000	101.039	3.32%
Debentures			
Houston Lighting & Power—convertible debentures 3¼% 1967 (being offered initially to commonholders of record June 17 to expire July 7 on basis of $50 principal amount of debentures for each 16¾ shares held; debentures are to be converted initially into common at $17.50 per share)	$14,366	$100.00	3.25%
Common Stock			
Public Service Co of New Mexico—173,136 sh (being offered commonholders on 1-for-7 basis, record June 17 to expire July 8)	$1,385	$8.00	7.00
WEEK OF JULY 10-16			
Bonds			
Commonwealth Edison—1st mtg 1982	$40,000	.....	.....
Knoxville, Tenn., electric revenues 1956-1972	1,250	.....	.....
Preferred Stock			
Public Service Co of New Hampshire—50,000 sh $100 par	$5,000	.....	(a).....
Common Stock			
Southern Co—1,004,510 sh (being offered to commonholders on basis 1-for-16 basis, record June 19 to expire July 10)	$12,808	$12.75	6.27%
Florida Power Corp—309,360 sh (being offered commonholders on 1-for-5 basis, record June 30 to expire July 16)	6,187	20.00	6.00
SCHEDULED FOR JULY-AUGUST-SEPTEMBER			
Bonds			**Bid Date**
Pennsylvania Electric—1st mtg 1982	$9,500	.....	Aug. 5
Arkansas Power & Light—1st mtg 1982	15,000	.....	Sept. 9
Preferred Stock			
Gulf States Utilities—50,000 sh $100 par	$5,000	.....	July 22
Pennsylvania Power & Light—100,000 sh	10,000	.....	(b) July 29
Pennsylvania Electric—45,000 sh $100 par	4,500	.....	Aug. 5
Common Stock			
General Public Utilities—531,949 sh (being offered commonholders on 1-for-15 basis, record July 1 to expire July 23; additional stock to carry 35¢ dividend payable Aug. 15)	$11,171	$21.00	6.67%

Notes—(a) Company rejected competitive bid of 100.02 for 5.60% rate by Kidder, Peabody & Co—Blyth & Co group. Company is planning a negotiated deal with R. W. Pressprich & Co and Spencer Trask & Co group, underwriters; and (b) First Boston-Drexel & Co group, underwriters.

CALENDAR

Rocky Mountain Electrical League
Fall Convention, Colorado Hotel, Glenwood Springs, Colo., Sept. 7-10.

American Standards Association
National Standardization Conference in conjunction with Centennial of Engineering, Museum of Science-Industry, Chicago, Ill., Sept. 8-10; 34th Annual Meeting, Waldorf-Astoria Hotel, New York, Nov. 19.

American Society of Mechanical Engineers
Fall Meeting, Sheraton Hotel, Chicago, Ill., Sept. 8-11.

Illuminating Engineering Society
National Technical Conference, Edgewater Beach Hotel, Chicago, Ill., Sept. 8-12.

***Instrument Society of America**
7th National Instrument Conference-Exhibit, Cleveland Auditorium, Cleveland, Ohio, Sept. 8-12.

Edison Electric Institute
Accident Prevention Committee, Sheraton Hotel, Rochester, N. Y., Sept. 15-16; Prime Movers Committee, Roosevelt Hotel, New Orleans, La., Oct. 6-7; AEIC Joint meeting, Meter-Service Committees, Mayflower Hotel, Washington, D. C., Oct. 6-8; Electrical Equipment Committee, Roosevelt Hotel, New York, Oct. 13-14; Transmission-Distribution Committee, Hotel Adolphus, Dallas, Tex., Oct. 23-24.

Pennsylvania Electric Association
Annual Meeting, William Penn Hotel, Pittsburgh, Pa., Sept. 16-17.

Northwest Public Power Association
Accounting Section, Congress Hotel, Portland, Ore., Sept. 18-19.

Public Information Program
Annual Workshop Conference, Edgewater Beach Hotel, Chicago, Ill., Sept. 18-19.

Public Utilities Association of the Virginias
Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 19-20.

***Southeastern Electric Exchange**
Fall Meeting, Engineering-Operation Section, Atlanta Biltmore Hotel, Atlanta, Ga., Sept. 25-26; Accounting Conference, Jung Hotel, New Orleans, La., Oct. 16-17; Sales Conference, Thomas Jefferson Hotel, Birmingham, Ala., Oct. 29-31.

* Addition this week.

REGULATION

Fairview, Okla., municipal plant has reduced rates $9,600 annually. New residential rate provides a minimum bill of $2 for 25 or less kwhr, 6¢ kwhr between 26 and 75 kwhr and 3¢ kwhr for the balance. . . . In recent hearing of Utah Power & Light Co to boost rates by $1.8 million a year, Public Service Commission indicated it may ask company to collect municipal franchise taxes from customers in cities where such taxes are imposed. . . . City officials in Paragould, Mo., joined with Missouri Utilities Co in a petition before the Arkansas Public Service Commission and received approval to increase electric rates by about 10%.

The Cove Island Question

Connecticut L&P has two choices: Find a new power plant site or battle the opposition of the people of Stamford

Because of the opposition of the people of Stamford, Connecticut Light & Power Co would accept a power plant site other than the disputed one at Cove Island, if another site were available.

That was the view expressed last week by Sherman R. Knapp, president, and Walter F. Torrence, company counsel.

CL&P recently purchased the 40-acre island in Long Island Sound off a Stamford residential area to build a steam plant whose capacity eventually would approach 500,000 kw. The city strongly opposes construction of a plant there and wants to turn the island into a public park.

"We'd accept another site," Knapp commented, "but so far as we know, there just is no other site available."

Going Ahead . . . He said that as things stood now, the company expects to proceed with legal efforts to make construction of a plant at Cove Island possible.

These efforts include continuation of arguments before the State Public Utilities Commission and opposition to a condemnation suit recently filed against the property by the City of Stamford.

The PUC held hearings on the Cove Island case at Stamford in May. The city contended at that time that the commission did not have jurisdiction, but the commissioners decided it had. CL&P then put in its case for constructing the plant at the site, declaring it was the only prospect from the New York State line to Westport.

Hearings Put Off . . . After the company concluded testimony, the PUC postponed hearings until last week, when the city was scheduled to state its objections to the plant. But early this month the commission issued an order postponing hearings until September.

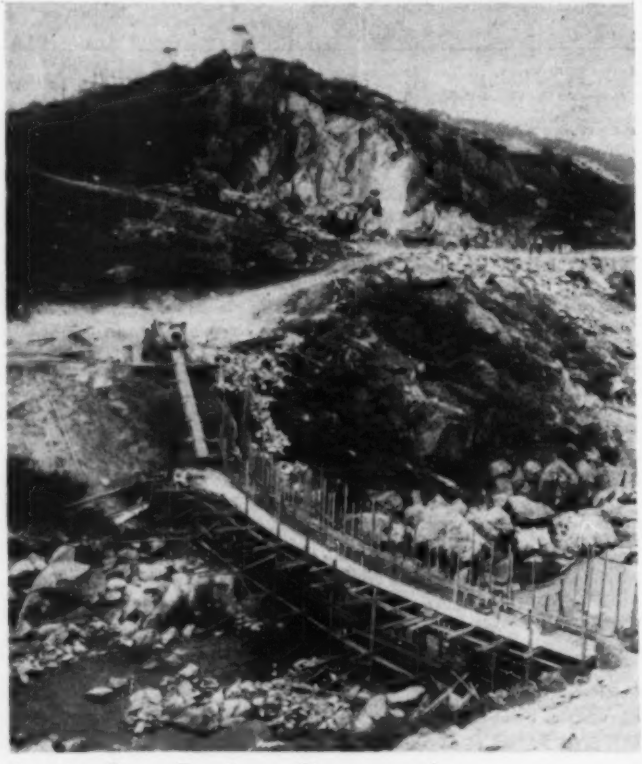
William R. Connole, PUC counsel, said the action was taken "primarily because of the pressure of business now before the commission."

The city's condemnation suit to acquire the site from CL&P will not come up for hearing before the Superior Court's October Term, according to George F. Lowman, special counsel retained by Stamford to handle the case.

Residential Area . . . Lowman said opposition to the plant had developed because Cove Island is zoned for residential purposes and is across from a well-kept-up residential section.

"The city," Lowman said, "definitely wants the site for a beach, park and recreational area, and is willing to buy it from the power company if the power company can find another site."

Connecticut L&P, on the other hand, contends it needs Cove Island to expand facilities to meet the growing demand in Fairfield County, in which Stamford lies. The site, a company spokesman testified, would permit most economical operation of the plant, since it provides large quantities of cooling water needed and deep water for docking coal-carrying ships.



Australian Project Progressing

On the headwaters of the Snowy River in a hitherto inaccessible corner of Australia's highest mountain region, the Southern Alps, Selmer Engineering, Ltd, of Oslo, Norway, is forging ahead in its construction of the Guthega Project. The project is part of a $500 million Snowy Mountains hydroelectric development, which will provide 2,750,000,000 kwhr of power annually, and over 2.5 million acre ft of water for irrigation by trapping and diverting snow-fed waters of the Snowy River and adjacent streams.

Guthega includes a dam, 115 ft high and 225 ft across, connected by three and one-quarter miles of tunnel to the Munyang Power Station, where two, and eventually three, turbines will generate 30,000 kw each. Excavation on the lateral foundation of dam is shown in process at top of above picture.

Let's Use Aluminum Not Abuse It!

A logical plan of selective usage should be adopted to maintain existing standards of reliability and economics as electric supply systems undertake the conversion from copper to aluminum

L. F. HICKERNELL, Chief Engineer, and L. L. CARTER, Assistant Chief Engineer
Anaconda Wire & Cable Co., Hastings on Hudson, N. Y.

Favorable experience in the use of ACSR for overhead high-voltage transmission and rural distribution is not directly applicable to the use of aluminum in overhead urban distribution and insulated conductors. Frequent reference to experience and economics in overhead transmission is tending to minimize the problems of introducing aluminum in overhead urban and underground distribution, interior wiring, and electrical apparatus, and to mislead as to the economics of such conversion.

Limitation of space for adequate connectors and need for a large number of low-cost splices and taps make the application of aluminum conductors to distribution considerably different from transmission. The economics of ACSR in overhead high-voltage transmission and rural distribution are in many cases based upon savings in structure cost which rarely can be made in urban distribution.

By the selective use of aluminum, sufficient copper can be released for applications where it can be used to advantage. This can be accomplished most logically by adopting a systematic plan of conversion in which the easiest, safest, and most economical applications are undertaken first and followed, if necessary, by more difficult and complicated conversions. However, conversion is a matter of choice because it is not anticipated that the present tight market situation in copper will continue as more production becomes available. A suggested program in steps for conversion from copper to aluminum is presented herewith.

Overhead Transmission

The most extensive experience with aluminum conductors has been with ACSR in overhead high-voltage transmission and rural primary distribution. Domination of ACSR in overhead high-voltage transmission, at least in the past 20 years, reflects great credit upon both the originator of this design and the constructors of these lines. Credit is due to both because of the many inherent problems which were solved jointly over a long period to provide satisfactory performance.

Maintenance, now undertaken occasionally to replace conductor or splices (or reinforce them), is usually on conductors installed in the early days. However, such activities might serve as a reminder that use of all-aluminum conductors in overhead urban distribution and insulated conductors today may be in the same position as was the application of ACSR to transmission many years ago.

Modern splices and terminations for ACSR combined with oxide inhibitors generally have been satisfactory except in coastal and contaminated industrial areas. However, because of size and cost, this type of design cannot be used in most applications of all-aluminum conductors in urban distribution, service drops, and insulated conductor assemblies. It cannot be assumed that reliability equivalent to ACSR in transmission can be obtained with all-aluminum conductors in urban distribution if many of the small inexpensive splices and taps, which have been proposed, are used. Most of these are now unproven designs with no background of actual field experience.

This points to the need for getting down to brass tacks to arrive at solutions for splicing and terminating all-aluminum conductors in distribution and insulated cable assemblies. We know the many advantages of aluminum metal per se. Let us examine the present limitations in the use of aluminum conductors and try to overcome them.

Underground Transmission

On an individual project basis, fairly substantial amounts of aluminum could be used in the conductors of underground high-voltage, pipe-type cable for 69-kv and above transmission systems. These installations are costly, designed and built from scratch, require considerable advance planning and the assemblage of specialized personnel and tools. They involve pipe fittings of such size that aluminum conductors of adequate size could replace copper without introducing additional costs for the pipe and pipe structures in many cases.

Favorable experience with compression-type connectors on ACSR is not directly applicable to all-aluminum insulated conductors. Aluminum has a high rate of creep. In compression-type splices for ACSR, this is compensated for by distributing the stress (i.e., low unit stress) resulting in a very long connector. Such a design would be impractical for a paper-lead cable joint in a manhole, because of space.

This is far different from overhead urban distribution where greater attention must be paid to holding down the cost of individual items because of their number.

On the other hand, normally less than 5% of the copper

ALUMINUM FOR DISTRIBUTION

IS IT A BIG GAMBLE?

LOGICAL STEPS IN CONVERSION FROM COPPER TO ALUMINUM

In Order of Preference From the Standpoint of Long-Time Economics and Service Reliability

1. **Overhead high-voltage transmission**
2. **Rural distribution primaries**
3. **Bus conductors—generating plants and substations**
4. **Overhead urban distribution primaries**
5. **Overhead street-lighting conductors**
6. **Open-wire secondary services**
7. **Service drop cables**
8. **Overhead urban distribution secondaries**
9. **Underground high-voltage pipe-type cable**
10. **Aerial insulated cable**
11. **Interior wiring—large conductors**
12. **Underground distribution**
13. **Service entrance cables**
14. **Interior wiring—small conductors**
15. **Portable cords and power cables**
16. **Equipment cables subject to movement and vibration**
17. **Magnet wire in apparatus**

used in electrical power conductors is consumed in paper-insulated lead-covered cable. Thus it would seem undesirable to plan long-time conversion in this product. At present, the use of aluminum may have to be considered in specific installations because of the temporary copper shortage and governmental restrictions.

Overhead Distribution

Because a very large percentage of the electrical conductors installed annually goes into overhead distribution, it would seem that this is the application to concentrate on for the maximum usage of aluminum. About half the copper used for power conductors goes into utility systems and a substantial proportion of this is used in overhead distribution. Replacement of 50 to 75% of this metal with aluminum should be of great help in releasing copper for use in underground transmission and distribution, branch circuits in interior wiring, communication, etc.

Thus problems of connecting conductor-to-conductor and conductor-to-equipment are kept to a minimum compared to those in the application of insulated conductors and magnet wire in apparatus.

Overhead Primaries . . . A considerable percentage of overhead urban and rural distribution primaries is already being installed with ACSR. This can be further increased as the larger conductor sizes of copper in high-density loads areas are extended or replaced by all-aluminum or ACSR. The dividing point between the use of ACSR and all-aluminum conductors would probably be between 1/0 and 3/0 Awg depending upon geographical locations, and wind and ice loading conditions. All-aluminum, rather than ACSR, should be used only when the conductor size is strong enough to maintain the reliability built into existing systems by the use of hard-drawn copper conductors.

Overhead Secondaries . . . Here the problem is more complex than with primary conductors because of the tremendous number of taps necessary to connect service wires or cables. The pressure is great to use lowest-cost fittings. It may be argued that difficulties with service wires affect only one customer (at a time), but excessive maintenance costs and much customer ill-will may be incurred if taps and connections develop wholesale trouble.

Service Wires and Cables . . . Because service drops constitute in some cases 30 to 40% of the metal purchased for overhead distribution, this has been a most attractive field for conversion. The predominant trend has been toward neutral-supported service drop cable, if service cables of the concentric type formerly have been used. A number of companies have avoided this variety by continuing to use open-wire services. For these, many companies prefer solid rather than stranded conductors, at least in No. 4 Awg size, because these may be served back upon themselves rather than clamped at service rack and weatherhead. Stranded all-aluminum conductors require clamping (or cutting off the covering and serving with bare wire) to develop sufficient holding strength. However, No. 4 Awg covered ACSR is now being installed without clamps.

Some companies which have used concentric service cables from pole to weatherhead to meter give consideration to concentric types with aluminum conductors. The obstacle has been the connection at the meter because the meter box terminal is not considered adequate for aluminum conductors. A few have gone ahead with straight-through connection of aluminum conductors into the meter box. While this is an adventurous and bold move, the wisdom will be questioned should overheating and burning due to high resistance occur at terminals, as is likely.

Several companies are using aluminum neutral-supported conductor from pole to weatherhead, and copper concentric service cable from weatherhead to meter.

The most conservative and reliable neutral-supported service drop cable of aluminum would seem to be that incorporating an ACSR neutral as the mechanical support (preferably with a covering) with the insulated aluminum wrapped or spiralled about this supporting member.

Argument as to the proper connector between this service drop cable and secondary line conductors continues. Some favor split-bolts with a bimetallic washer, others a compression fitting, and some a bolted-grooved clamp. There is some evidence that difficulty may be encountered with all of these, and contrary evidence that they will work very well based upon experience with ACSR.

If utilization of electricity in the home grows as predicted, current loadings can become very high, and the experience with these fittings on ACSR primary conductors may be misleading. Such troubles may be accentuated with stranded aluminum as small as No. 4 and No. 6 Awg.

Underground Distribution

Some metropolitan systems use so much of their metal needs in underground distribution that conversion of their overhead systems will not release enough copper to accomplish the degree of substitution governmental agencies might wish. In this case aluminum must be considered for the conductor in insulated cables for underground.

Here reliability of splicing and terminating fittings under severe loading becomes critical. Many papers have pointed

out the absolute necessity of establishing an electrical connection to each strand of the conductors. Welding would seem to be one reliable way of accomplishing this although it requires different techniques than those now used.

It is often stated that "aluminum can be soldered." True, it can be under certain favorable conditions. To obtain a low-resistance joint by soldering sector conductors of multi-layers of oiled strands without damaging the insulation with fluxes, heat, etc, is, however, a neat trick, especially in a cramped manhole.

It has been proposed to use a relatively short connector (7 in. or so). To obtain adequate tensile strength and low electrical resistance, short connectors must be heavily compressed (i.e., high unit stress). Whether such connections will maintain their initial properties under cyclic and emergency (high-temperature) loading remains to be proven.

In existing conduit and manhole systems possible increased cable movement should be considered as it is directly related to sheath life. The thermal coefficient of expansion of aluminum is 36% greater than copper, and an equivalent aluminum paper-lead cable is lighter in weight. But cable expansion may not correspond to conductor expansion because of the restraining action of insulation and sheath, spring action of helical conductors, etc.

The overall cable movement resulting from this increase in conductor expansion under cyclic loading and less friction in ducts (because of lesser weight) is not known from actual field experience. However, it seems reasonable to expect that the movement of an aluminum paper-lead cable would be somewhat greater and hence the sheath life lower. In a new conduit run, provision for this increased movement could be made with larger manholes.

From the application standpoint there is a lack of design data to determine accurately the "equivalent" size of aluminum conductor necessary to use in place of copper for various installation conditions.

Generating Plants and Substations

Bus Bar . . . Aluminum bus bar has been used successfully, and further expansion in this application is logical. Such construction is comparable to underground transmission mentioned earlier in that specialized personnel and technique must be employed to handle the problems of satisfactory installation.

Station Cables . . . Large varnished-cambric or rubber-insulated station cables installed on insulators could logically use aluminum conductors. A minimum number of joints and terminals is used, and the installation work is usually performed by specialized personnel. Attention should be given to the terminating devices on associated electrical equipment such as transformers and switchgear.

Control Cables . . . It would seem that the application of aluminum in control cables would be one of the less desirable steps in conversion as these cables require such large numbers of connections to associated equipment. At present the terminals on panel boards, relays, etc, are designed for copper conductors and probably would not prove adequate for aluminum.

With need for utmost reliability in control circuits the element of risk should be avoided. A variety of exposures is encountered, vibration likely is present particularly at terminations, and small wire sizes are involved. Therefore, it is questionable whether conversion of control cables to aluminum should be considered except possibly for trial.

Interior Wiring

In interior wiring the greatest possible use of aluminum with the fewest problems can be made by concentrating on the larger sizes. This should be 1/0 Awg and larger, or perhaps as some have proposed, No. 2 Awg and larger. Refraining from the use of aluminum in small conductors, involving a large number of connections, will avoid the immediate problems of training installers and providing a line of fittings to handle the small-wire installations.

If stranded conductors are used to obtain the flexibility required for installation and splicing in the usual pull and outlet boxes, the flow (creep) of the aluminum is encountered when adequate pressure is applied in the small space available to provide satisfactory electrical connection. The use of various compounds in these splices to reduce oxidation of the contact areas requires the precaution of removing the excess to avoid softening of insulation and tape which can result in electrical failure. Because connections are certainly more difficult and costly, it is desirable to confine aluminum to the larger conductor sizes with fewer joints and terminals.

Another important factor is the large quantity of small size branch-circuit wire purchased in the retail market for installation by "handy-men" around the home and farm. Aluminum conductors installed by such untrained workmen, connected to wiring devices and appliances having terminations designed for copper, could create a potential source of trouble and hazard.

Economics

Much has been written—and more said—about the possible savings by the use of aluminum. Often these statements are based upon conductor first cost only. While this may be justified in a few situations, a more rational approach would consider full lifetime costs. In such overall economic studies, the differential in cost will vary greatly depending upon the accounting practice followed and the evaluation of certain indeterminate factors, for example:

1. Life of covered all-aluminum conductors and ACSR in distribution service, and insulated aluminum cables in underground service.

2. Scrap value of aluminum conductors, especially ACSR.

3. Cost of fittings.

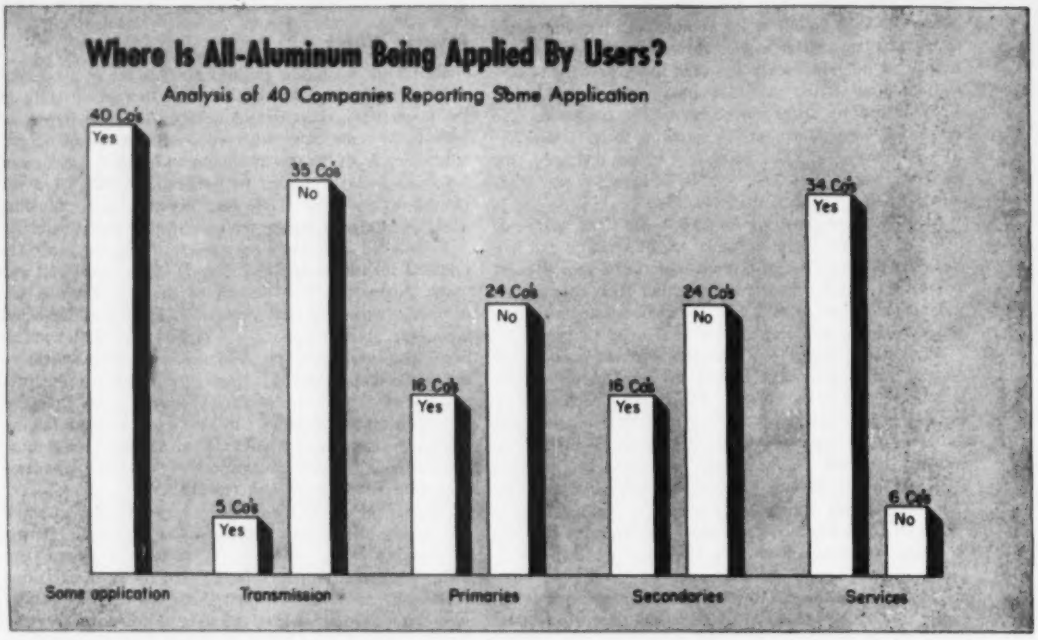
4. Installation cost of splicing and terminating insulated aluminum conductors.

Generalized statements to the effect that "aluminum is cheaper than copper" are unwarranted and can be misleading. Each application should be considered on its individual merits. For example, the use of all-aluminum conductors in the distribution system will often show a cost adavntage, the amount depending upon the assumptions made for the above factors. On the other hand, if covered ACSR is required for adequate physical properties, little or no differential may be apparent.

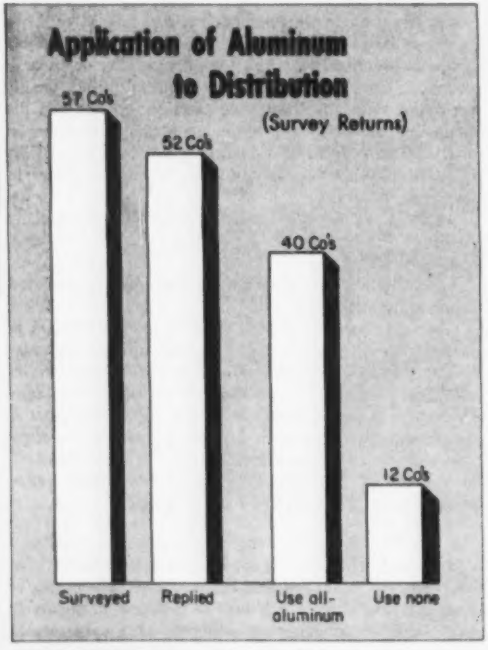
* * * *

In fields in which aluminum has proved satisfactory, its use should be continued and expanded. In new applications, operating experience should be obtained through trial installations before complete adoption on a large scale.

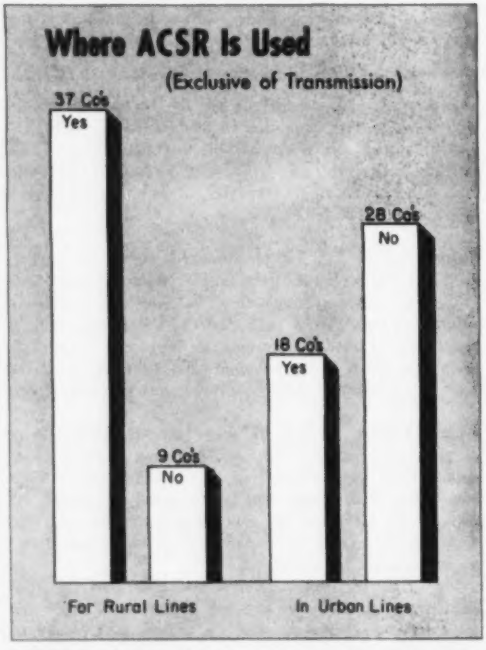
Let's make haste slowly. Let's USE aluminum—not ABUSE it!



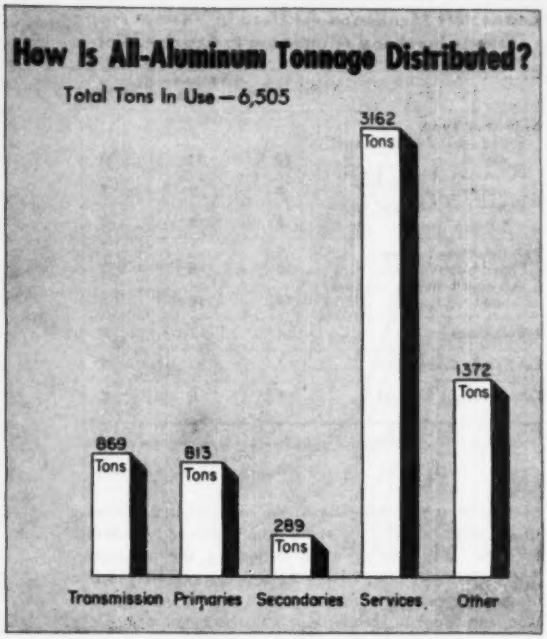
SERVICES are by far the most popular application among companies using all-aluminum. Thirty-four of 40 users apply it for this purpose. Applications to primary and secondary distribution circuits were reported by 16 users; transmission by 5 companies



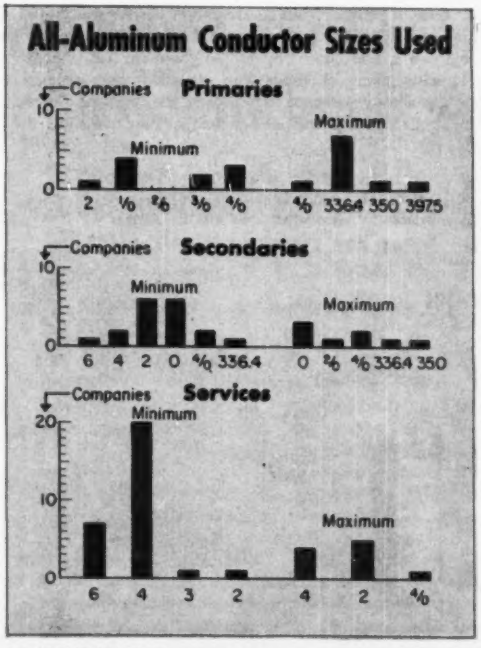
SURVEY COVERED 57 major electric utilities and all known users of all-aluminum, 52 replied, 40 use all-aluminum, 12 do not



ACSR USE in distribution finds 37 of 52 companies using it for rural lines, 18 in urban. No. 4 and No. 2 were most popular ACSR sizes



OF 6,050 TONS OF ALL-ALUMINUM in use by 40 companies almost half is in services, 25% in transmission and primaries



ALL-ALUMINUM SIZES used for primaries, secondaries, and services range widely. Commonly used sizes are charted above

ALUMINUM FOR DISTRIBUTION IS IT A BIG GAMBLE?

All-Aluminum Use Climbs Cautiously

Survey shows widespread trial application of all-aluminum to distribution in small amounts, mostly for services. Experience scant and inconclusive

Under the twin spurs of the metals pinch and a huge expansion program, utilities today are cautiously but conscientiously facing up to the task of finding out how to apply aluminum on their distribution systems.

To date applications have not involved vast tonnages. But a recent survey of leading power companies in all sections of the country shows that the number of companies using all-aluminum in distribution outnumbers non-users three to one. In summary, survey findings are these:

Extent of Use . . . There are 6,505 tons of all-aluminum wire and cable in use today among 40 of the 52 companies answering the survey. Nearly half this tonnage is in customer services. Another 25% is shared—almost equally—by transmission and primary distribution circuits. Secondaries account for 4½%; buses and other miscellaneous uses the remainder.

Only 12 of the 52 companies do not use all-aluminum at all. Of the 40 who use it somewhere in distribution, 34 use it in services, 16 in secondaries, and 16 in primary circuits. Five companies use all-aluminum in transmission.

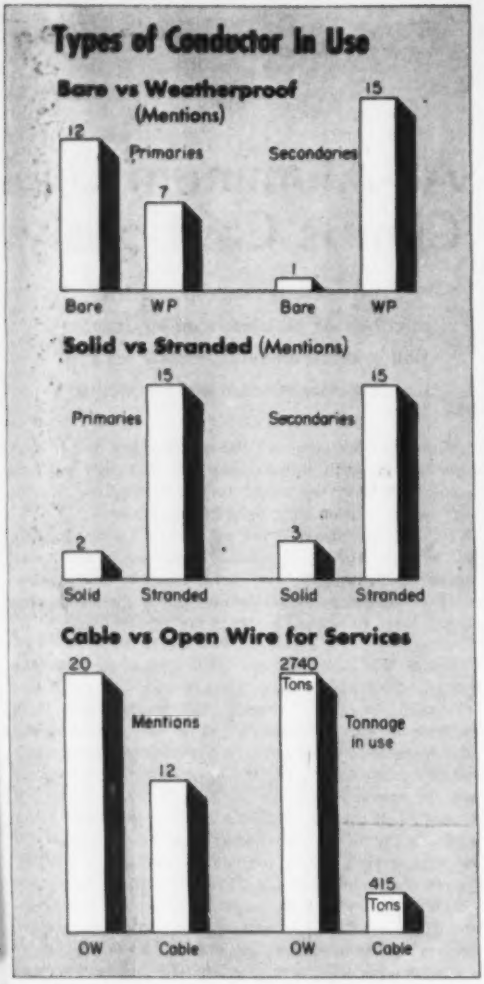
Stranded all-aluminum conductors were clearly preferred over solid for both primary and secondary applications, being mentioned in each case 15 times by the 16 users who apply all-aluminum to primaries and secondaries.

The preference for bare conductors for primaries and covered wire for secondaries was equally clear. Among the 16 using it for primaries 12 use bare and 7 weatherproof aluminum. Three use both. The preference was reversed for secondaries with 15 out of 15 using weatherproof secondary wire.

For customer services there was a 20 to 12 preference for open wire over cable among 32 user companies who apply all-aluminum to services. Tonnage-wise the division was 2,740 in open wire, 415 in cable.

Experience . . . Most frequently expressed reason advanced by users for not applying all-aluminum for primaries and secondaries was strength. Their objections were variously phrased as "ultimate too low," "our spans are too long," "sags excessive for joint use with telephone," or "use of copper and aluminum on same cross arms is objectionable."

Types of connectors used for all-aluminum-to-copper joints are summarized in the table herewith. Practices in applying these connectors was well defined. All but 4



Connectors Mentioned As Used In Various Applications Involving Aluminum to Copper Joints

	Primaries	Secondaries	Services
Split-Bolt Type			
Plated bronze body, plated washer	13	21	31
Aluminum body, bimetal washers	6	9	9
Bronze body, bimetal washers	5	7	9
Parallel-Groove Type			
Plated bronze body	10	6	3
Aluminum body, copper liners	19	12	6
2-Bolt Clamps	14	13	5
Set Screw Connector	...	...	4
Compression Sleeves	9	5	6

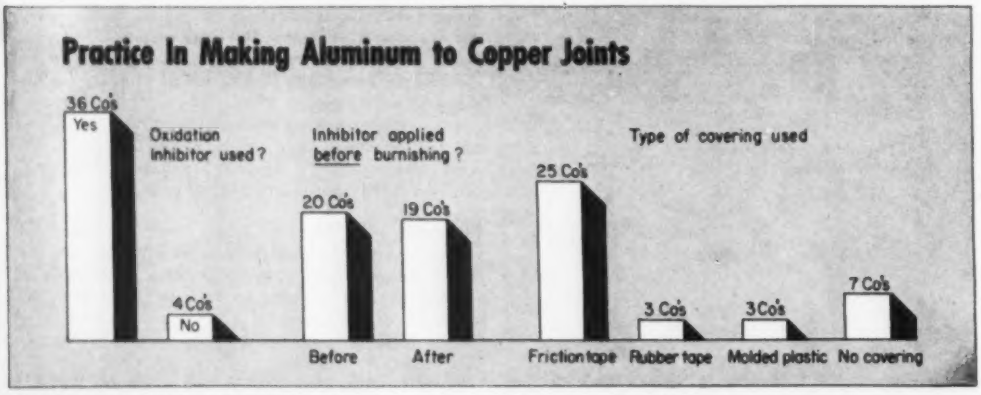
Totals add up to more than number of returns because most use more than one type.

of the 40 user companies apply an oxidation inhibitor to all joints, but they are about evenly divided on whether to apply it before or after burnishing the conductor. The majority of users cover joints with friction tape. Use of molded plastic, combinations of rubber and friction tape, and "Scotch" electric tape was also mentioned. Only 6 use no covering at all over joints.

Of the 40 all-aluminum users 29 say they use it anywhere. But 11 are more particular. Seven of these avoid the seacoast. Others avoid "salt and chemical plants," railroads, "industrial plants," "salt and alkali dust."

User experience with all-aluminum to date was classified as "generally satisfactory" by 22, "adequate" by 3, "passable" by 3, and "poor" by 1. No comment was offered by 11. But many of those who classified their experience as "generally satisfactory" added "to date" or "so far" or similar acknowledgment of inadequate experience.

WIRE AND CABLE TYPES preferred were bare-stranded for primaries, weatherproof for secondaries, open wire for services



CONNECTOR APPLICATION TECHNIQUE universally calls for use of oxidation inhibitor. Users split 50-50 over whether to apply it before or after burnishing conductor. Practically all users cover aluminum and copper joints with friction tape or equivalent

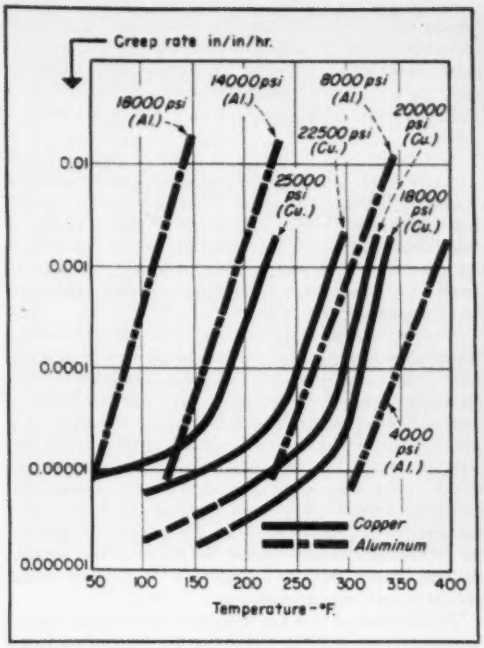


FIG 1—CREEP RATE COMPARISON of annealed electrolytic copper with hard drawn EC aluminum shows creep of aluminum is greater

FIG 2—COMPRESSION SPLICE in 350 MCM aluminum cable suitable for underground secondary network installation. Three deep indents are used on each cable end instead of two shallow, as with copper

FIG 3—HYDRAULIC PRESS making splice shown in Fig 2 exerts 80,000 lb in about 2/3 sq in or about 120,000 lb per sq in

Making Connections In Underground Aluminum Cable

Greater creep rate of aluminum compared with copper plays vital role in making proper connections in primary and secondary cables for underground. Cautions to observe and pitfalls to avoid are pointed out and explained in the following pages

J. **ROGOFF,** Chief Engineer,
I. **MATTHYSSE,** Chief Design Engineer
Burndy Engineering Co, Inc, Norwalk, Conn.

ALUMINUM FOR DISTRIBUTION **IS IT A BIG GAMBLE?**

Today when the electric power companies are considering the use of aluminum in underground systems, they face the problems of splicing and terminating aluminum cables. For copper, the connection problems have long been solved using mechanical, compression, or even solder connectors. For aluminum, new techniques must be employed to assure stable, low resistance connections.

Although compression connectors are used for splicing primary underground copper cable, soldering is still used. However, it is generally agreed that soldering is impractical for aluminum underground cable because of the great difficulty of obtaining reliable soldered joints, especially on stranded cable.

Mechanical clamp-type connectors suitably designed for aluminum are generally too bulky for underground applications, except for terminating secondary cable on bus bar or equipment. Mechanical split-cone type connectors such as have been used on multiple connectors for copper secondary cable are not available for direct connection to aluminum cable. The split-cone clamping elements designed for copper cable in these multiple connectors are inadequate for aluminum even though they are plated.

However, the development of compression type connectors for underground aluminum cable is well advanced so that there need be no hesitation in installing aluminum cable because of connectors.

Such connectors are installed by hydraulic compression tools, and the tubular compression sockets for the aluminum cable are made from aluminum. Although properly-designed plated copper-alloy, clamp-type connectors are entirely adequate for aluminum conductors, it is generally agreed that only aluminum should be used for sockets for receiving the aluminum cable of compression type connectors.

Design Considerations . . . Three basic characteristics make the problem of connecting aluminum different from the problems connected with copper. They are:

1. Corrosion
2. Surface Oxide
3. Creep

Corrosion is not of great significance in underground connectors as joints are always carefully taped. Taped joints on primary distribution completely exclude moisture, eliminating corrosion. However, secondary connections may not be entirely free from corrosion as moisture has been known to enter insulated secondary cable. Nevertheless, there is little possibility for electrolytic attack where the compression connectors and the cable are both aluminum.

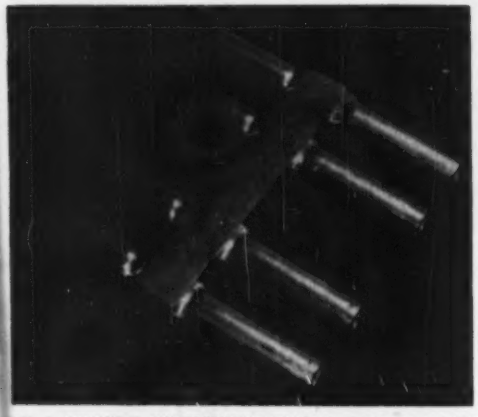


FIG 4—MULTIPLE COMPRESSION JOINT for joining 350 MCM aluminum cable to 500 MCM copper cable. Connectors are riveted and brazed to central copper bus bar

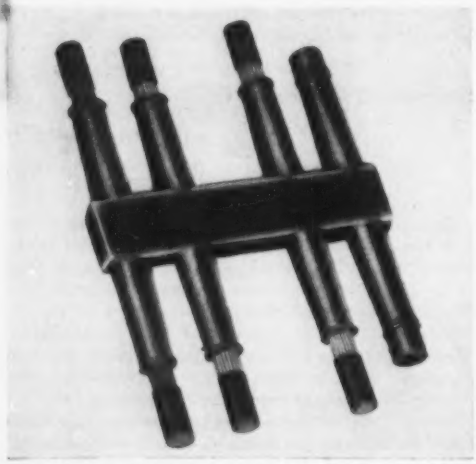


FIG 5—INSULATED MULTIPLE JOINT of Fig 4 for junctions involving both aluminum and copper cable

Surface oxide is the principal cause of high resistance contacts. Oxide on aluminum forms very rapidly and is a tenacious, high resistance film. It can, of course, be broken down by scratch brushing under petrolatum, but this is impractical on a stranded conductor. When the film is light it may even be broken down in applying the indentations to a compression joint because of the high pressures applied to such joints.

However, the breaking down of the oxide to form the lowest contact resistance can best be assured by using a joint compound, especially devised for that purpose. One such compound contains metallic zinc particles to form current-carrying bridges across the contact surfaces. This not only reduces the contact resistance of the cable to the connector barrel but also reduces the resistance between strands so that the current is evenly distributed among the individual strands. Thus, this compound avoids overloading and overheating of some of the strands. Of course, the compound prevents further oxidation of the contact surfaces, and if there is a possibility of moisture being present it seals against corrosion.

The influence of time and temperature on a compression joint may result in a "relaxation" of the metal of the connector and conductor. The "relaxation" of metal is the result of creep under pressure. In designing electrical connectors for aluminum, a comparison of the creep rates of aluminum and copper is very useful. Such a comparison can make the years of experience in designing copper connectors useful in designing connectors for use with aluminum conductors.

Although the creep rate of metals under compression has not been widely investigated, it is known to be approximately equal to the creep rate under tension. Considerable data are available on this latter phenomenon. Fig 1 compares the creep rate of annealed electrolytic copper with that of hard drawn EC aluminum. The curves show creep rates plotted against temperature for various applied stresses.

From these curves it is obvious that for the same stress and temperature the creep rate for aluminum is far greater than that for copper. A less striking way of comparing the creep of copper and aluminum, although probably more practical, is to compare the stresses at which the creep rate-temperature curves for copper and aluminum are most nearly equal. For example, the curve for copper at 25,000 lb per sq in. approximates the curve for aluminum at 12,500 lb per sq in. At lower stresses, the difference is greater. Thus the curve for copper at 18,000 lb per sq in. is approximately equal to that for aluminum at 6,500 lb per sq in.

Applying Creep Data . . . When applying this creep data to compression connectors it should be noted that the pressure exerted by the indenting tool, usually a portable hydraulic press, is far greater than that necessary to cause the metal to flow and take a permanent set. Such applied pressure may range between 50,000 and 100,000 lb per sq in. or perhaps even more. Fig 1 shows that neither cop-

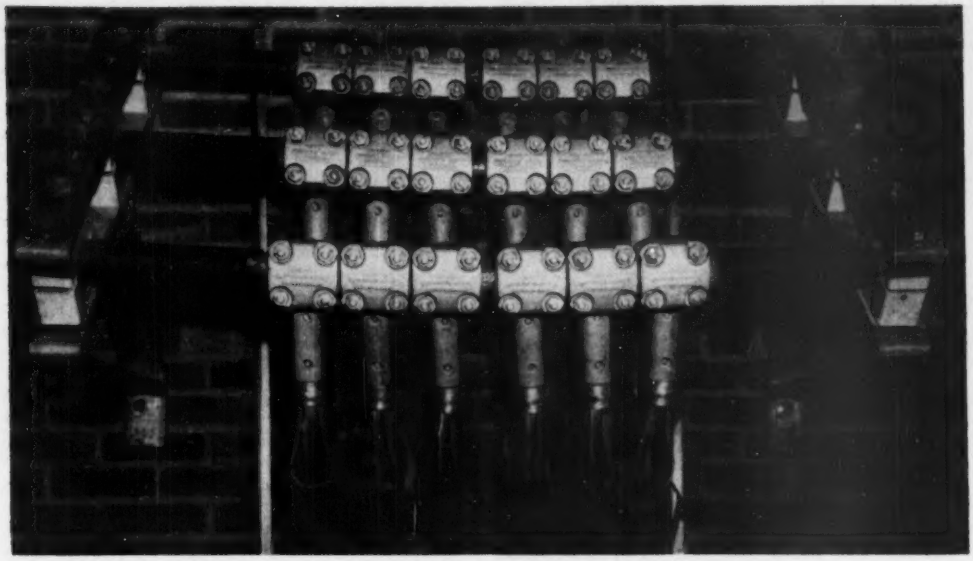


FIG 6—BANK OF CONNECTIONS of 750 MCM aluminum Limiter taps to 3,000 MCM compact segmental aluminum ring bus

per nor aluminum can maintain pressures of this magnitude without relaxing. As a result, when the compressing tool is released from the indent in the connector barrel, the pressure that remains exerted by the barrel on the cable drops to the pressure that can be sustained by the metal of the cable without appreciable creep.

At the temperatures at which underground distribution cables usually operate, this pressure appears to be about 16,000 to 20,000 lb per sq in. for copper and about 4,000 to 8,000 lb per sq in. for aluminum. However, at the elevated temperatures to which an underground network cable may be subjected as a result of temporary overload, the pressure may be as low as 12,000 lb per sq in. for copper and only 2,000 to 3,000 lb per sq in. for aluminum.

This means that indented or crimped connections on stranded aluminum conductors not only should be larger in area but that the indent should be deeper. The deeper indent is necessary to cause greater flow of the individual strands, thereby causing these strands to flatten one on the other to a greater extent. Thus, the areas in contact, not only between connector and cable but also between strands of the cable itself, are enlarged.

Connections in Secondary Networks . . . A secondary network system is designed to clear cable faults by the operation of Limiters, unless the fault burns itself clear. This device is designed to permit the insulation on the cable to approach its "roasting point" before it clears the fault. Under such conditions the conductor temperature may go as high as 200 to 250 C. At such temperatures aluminum rapidly anneals and its creep rate is greatly increased. Therefore a heat cycle test procedure has been devised to determine the suitability of connctors for such occasional high temperatures.

In this test each cycle consists of heating the connection by current to 200 to 250 C and allowing it to cool to room temperature, repeating many times. It is considered that joints will operate satisfactorily in a secondary network if there is virtually no change of resistance in this heat cycle test.

It has been found that aluminum compression connectors, which are entirely adequate for less severe overload conditions, such as in building wiring or in primary cables, must be made about 50% longer and installed with one or more additional indentations for use on secondary network cables. Fig 2 shows a 350 MCM aluminum cable in a compression splice suitable for underground secondary network installations. Note that the joint is made with three deep indentations on each cable end. This compares with the two shallower indentations ordinarily used on copper cable of the same size.

Installation of the sleeve on aluminum cable by means of a portable hydraulic press is shown in Fig 3. Prior to insertion of the cable ends into the connector, the connector compound fills the barrel and is forced around and between the strands as the cable ends are inserted. The press shown exerts a total of 80,000 lb of pressure on a projected area of about two-thirds sq in., or about 120,000 lb per sq in.

The problem of making secondary network connections with aluminum cable is further complicated by the fact that network junctions will undoubtedly involve both aluminum and copper cables. Fortunately, the simple aluminum compression splice connector can be varied to provide multiple connections between aluminum and copper cables.

Fig 4 shows a bare multiple compression joint for joining 350 MCM aluminum cable to 500 MCM copper cable. A central copper bus bar is provided to which cable connectors with flattened center sections are both riveted and brazed. The brazing of the aluminum connectors to the central copper bar was solved with a special brazing alloy providing an excellent electrical connection, with

the rivets assisting in providing the mechanical strength.

Insulated multiple compression joints, shown in Fig 5, for junctions involving both aluminum and copper cable are also available. However, because the present rubber molding equipment is limited to 500 MCM copper connectors, the heavier wall thickness of the aluminum connectors limits them to 350 MCM aluminum cable.

Today, when utilities have equipment and connectors available for copper cable, aluminum cable may be introduced by the use of adapters. An adapter consists of a tubular aluminum compression socket to receive the aluminum cable, joined to a plug which may be inserted into a copper connector. Such an adapter may be used to join aluminum cables to multiple connectors which use mechanical clamping elements of the tapered cone type.

Another form of adapter is the "reducer" for joining an aluminum cable to a copper cable, end to end. It consists of an aluminum and a copper compression socket joined together at the factory. By means of a reducer the presently available copper Limiters may be used in aluminum cable by splicing a short length of equivalent copper cable to the aluminum cable with the reducer and then indenting the copper cable directly to the Limiter.

It is generally agreed that the Limiter for the equivalent copper cable provides proper protection for aluminum cable. However, studies have been started to determine the insulation damage characteristics of aluminum secondary network cable, which may influence the selection of the proper Limiter time-current characteristic curves for this cable.

It is, of course, possible to provide all-aluminum Limiters for aluminum cable. Fig 6 shows the connection of 750 MCM aluminum Limiter taps to 3,000 MCM compact segmental aluminum ring bus. The recessed bolted cable connections on the ring bus are cast heat-treated aluminum alloy to which pure aluminum fusible Limiter sections are welded. The aluminum cable tap connectors are welded to the other end of the fusible sections. These in turn are welded to the aluminum tap cable by Argon welding.

Connecting Primary Cable . . . The problems of connecting primary aluminum cable are different from those in the secondary system. For one thing, the possible effects of the connector compound on the quality of the insulation is of great importance. For example, Penetrox "A" uses a petrolatum type vehicle, and it is known that such compounds can cause slight swelling of rubber insulation. For low voltage joints after the excess Penetrox has been wiped off, the possible effects of the Penetrox on the tape or conductor insulation is negligible. However, for primary voltage any possible deleterious effect on the dielectric properties of the insulation cannot be tolerated.

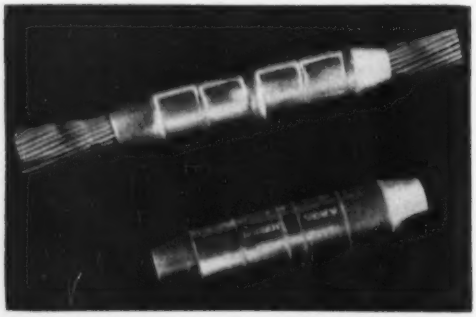


FIG 7—TAPERED SPLICE connector for 500 MCM sector-shaped aluminum cable, shown before and after making circular indentations

New Compound . . . For primary voltages, therefore, a new compound has been developed having zinc particles suspended in a polyisobutylene vehicle. It has no deleterious effect on rubber or rubber-like insulations nor on paper or varnished cambric insulation. In fact when mixed with the cable impregnating oil it does not alter the power factor. Its disadvantage is its stickiness which makes it difficult to remove from any surfaces with which it comes in contact. However the difficulty of handling is reduced to a minimum by furnishing the connectors partially filled with compound and corking them.

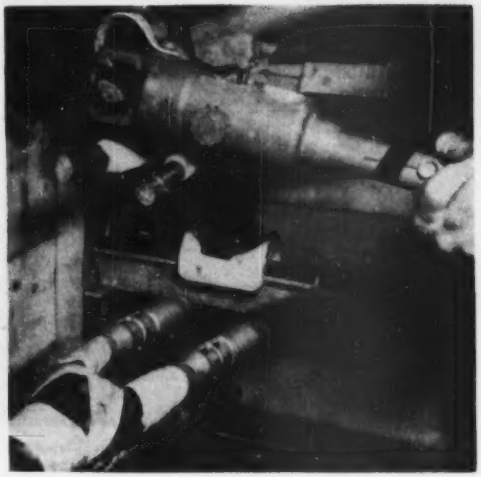
Primary cables cannot be subjected to temperatures as high as might be tolerated on secondary cables because of the damage to the dielectric properties of the insulation that such high temperatures would produce. Therefore, heat cycle tests at temperatures of 100 or 125 C instead of 200 to 250 C are adequate. This reduced requirement permits shorter contact lengths and fewer indentations on primary connectors, especially for the larger aluminum cable sizes. For primary cable splices the shorter connectors are desirable to reduce the overall length of the finished three conductor splices. In addition, the shorter contact lengths require less bending of the cable to permit its insertion into this connector.

Although tapered ends on splice connectors for 5 or even 7.5-kv primary cables may not be necessary, it is generally agreed that such tapers are important for higher voltage operation. Fig 7 shows an aluminum tapered splice connector for 500 MCM sector-shaped aluminum cable. It was found that a hydraulic press could be used to indent such sleeves with very little more space between conductors than has been used for the same size copper cable. In addition the overall dimensions of the finished splice were only slightly greater than for a splice on the same size of copper cable.

Although the ridges left on the splice connector by the circumferential dies are small and fairly well rounded, on primary voltages of 13.2 kv and higher it is advisable to fill the indentations with an inert compound and wrap metal shielding tape over the connector between tapers to provide a smooth external contour. However, connectors can be furnished which will have a smooth external contour after compressing with the proper dies.

The design of the tapered splice connector can be incorporated in other forms of connectors for primary aluminum cable. For example, compression type reducers having one end of copper and the other of aluminum should be used to join aluminum primary cable to existing copper cable. Branch or wye splice connectors can also be furnished for combinations of aluminum and copper primary cable.

Research into the properties of aluminum contacts and the development of connectors for aluminum conductors is still progressing at an accelerating pace. Nevertheless, the proper technique for connecting aluminum conductors is now well developed, and good connectors are available. Therefore the problem of making connections should not cause any hesitation in selecting aluminum cable for underground distribution.



New splicing technique developed for aluminum-conductor cable

1. PORMING PENCILS by tearing tapes "free hand." Construction joints had 1/2 in. of last few tapes left extending beyond the pencil at this stage to protect strand shielding tapes

2. CONNECTORS COMPLETELY PRESSED on ends of first cable. Shipping caps hold paste in other ends of connectors. Hand press is rounding sectors of second cable

CONTINUED ON NEXT PAGE

Boston Edison Installs First 15-Kv Aluminum Underground Cable

Two 26,000-ft cable lines have three 500 MCM compact sector conductors of aluminum. Two types of compression connectors are used, one round, one sector-shaped. New splicing techniques developed. Lighter cable weight permits pulling 1,185-ft lengths. Bigger offsets require larger manholes

C. F. AVILA, Head, Service Section, Engineering and Construction Dept, Boston Edison Co

Late in 1951 Boston Edison Co found that it would be necessary to run two 15-kv lines to a new factory in a nearby suburb in the spring of 1952. About 26,000 ft of cable were involved in the project. However, when bids and delivery dates were received, it was clear that cable with copper conductors would not be available in time. However, aluminum conductor cable was available. In view of the prevailing copper shortage it was deemed desirable to use aluminum conductor cable and release copper for vital needs.

Although not previously used, connectors for aluminum cable offered no apparently insurmountable difficulties. Experience gained in other applications gave evidence that proper connectors could be devised, tested, and fabricated by the time the cable itself was manufactured.

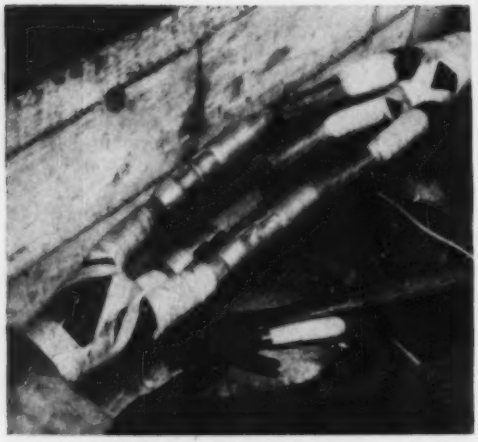
The two new cable lines will supply other future loads in the area. The ultimate use will require either 350 MCM copper or 500 MCM aluminum circuits, but for the present the factory load supplied over 1/0 copper connections into the plant is the only load.

As ordered, the cable consisted of about 26,000 ft of 3-conductor, compact-sector 500 MCM aluminum with conventional strand and conductor shielding, insulation, and sheath, similar to an AEIC cable of the same copper conductor size. Thus in the cable cross-section the color of the conductor is the only departure from conventional appearance.

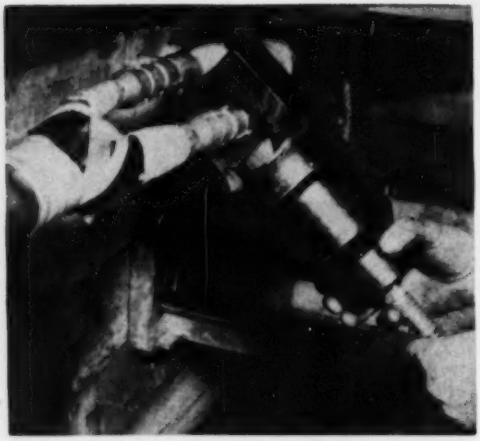
Weight Economy Gained . . . This aluminum cable is considerably lighter than copper:

	Lb. per 1,000 ft.
Three 500 MCM 15-kv compact sector copper	11,210
Three 350 MCM 15-kv compact sector copper	8,964
Three 500 MCM 15-kv compact sector aluminum	7,853

This comparison shows the aluminum conductor cable to be about 30% lighter than a copper cable of the same cross-section and about 12.5% lighter than copper of the nearest equivalent carrying capacity. In view of this, maximum pulling lengths of 1,185 ft were selected as entirely practical, although they were some 20% greater than previous Boston Edison field practice. Such lengths are believed to be above the range where they have any additional

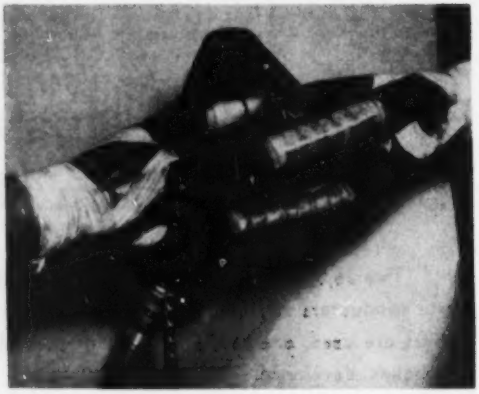


3. INSERTING ENDS of second cable into connectors. Temporary wires that hold rounded conductors are removed as soon as conductors are well entered in the cylindrical splicing sleeve



4. PRESSING CONNECTOR on second cable with 40-ton press. Note only one indent is made in second side of upper connector 'till remaining conductor sleeves have been similarly pressed

6. WOOD FLOUR-CABLE OIL PUTTY and aluminum-foil tape being applied to shield connector indents. Rest of joint is conventional



7. SECTOR SHAPED CONNECTORS used on second line have internal serrations. Do not require shielding. No paste is used

ALUMINUM FOR DISTRIBUTION IS IT A BIG GAMBLE?

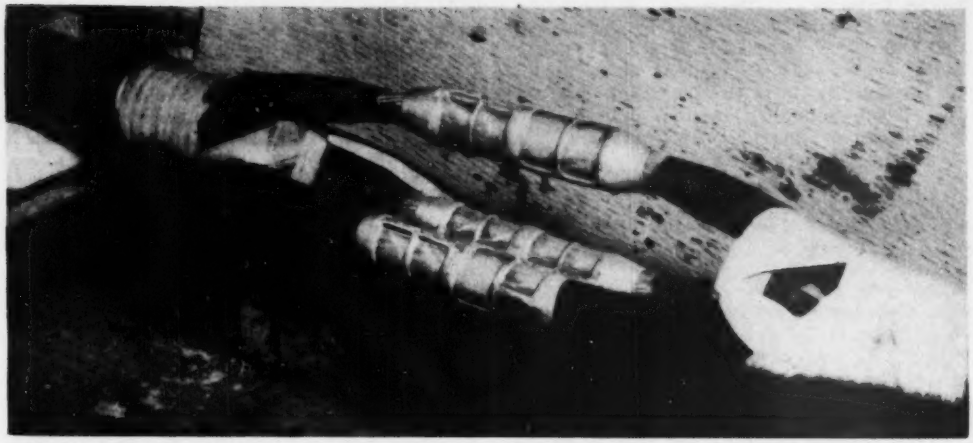
effect on cable motion in manholes due to load cycles.

Early Connection Problems . . . Early trials made it evident that soldered connections, though theoretically possible, required the use of fluxes considered dangerous if residues were left within high voltage paper cable insulation. Noxious fumes given off by these fluxes and exact temperature control needed for successful results are further objections. Further it was expected that somewhat erratic results and questionable permanence of the connections would occur unless there was more time to train personnel than was actually available.

Early attempts to join conductors by welding failed even when using the latest inert gas-shielded equipment, apparently due to vapor given off by oil in the strands when heated. Partial success was later attained, and certain techniques appear to merit further study. But it was evident that a completely successful technique would not be developed in the time available. All effort was therefore directed toward compression connectors.

Two Types of Connectors . . . The straight joints finally adopted are of two types. The first 26,000-ft cable line is spliced with round aluminum compression connectors, the second with sector-shape connectors.

Connectors on the first line have tapered ends, a central dam or plug, and are filled with a paste of zinc dust and vistanex-type cable oil. This is not the same zinc dust paste commonly used in overhead line work. The petrolatum base in the latter



5. CONNECTORS FULLY PRESSED. Excess zinc paste pushed from inside the splicing sleeve, when conductors were inserted, has been wiped away and the connection flushed completely with hot oil. Insulation pencils have been sanded and taping commenced

paste was found to have a detrimental effect on the power factor of cable oil.

Use of round connectors requires a pre-rounding of the sector shaped conductor before they will enter the connectors. Strands on the ends of one cable can be roughly rounded with large slip-joint pliers, and then the connectors driven on. When the ends of the second cable enter the connectors, however, they must slip in together and freely. Therefore, they must first be rounded with a hydraulic press and proper dies and held temporarily with turns of wire.

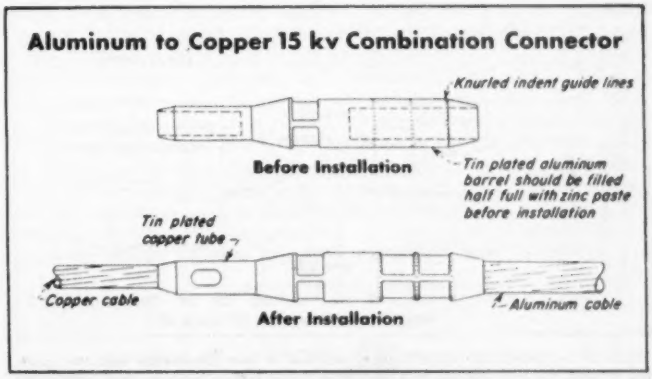
Each connector may be completely pressed on the ends of one cable before proceeding to the next. But when the second half of a connector is pressed, one dent must be pressed on each conductor and then a second dent on each. If this is not done, the elongation that occurs if one conductor is first completely pressed causes the other two conductors to pull partially out of the unpressed connectors. This creates a situation that is probably impossible and certainly impractical to correct.

Indents on the round connectors are of the complete circumferential type except for narrow ridges. Existence of these ridges and the ridges between adjacent indents requires the use of a filler of wood-flour, cable-oil putty and shielding with 0.003 x ¾-in. soft aluminum tape to form the exterior of the indented connector into a smooth cylinder and minimize corona effects.

Connectors for Second Line . . . These are sector-shape and have internal circumferential serrations formed in the connectors before shaping. This with other factors makes it possible to avoid the use of zinc dust paste. Dies leave only a slight flash or fin that can be quickly removed with a file. The resulting smooth surface makes filler putty and shielding of the connector unnecessary.

One end of each of the new lines is connected to existing copper lines. To avoid use of tap joints in these first aluminum high-voltage cables, it was decided to tap the existing lines with three conductor MCM 350 copper cables in the usual way and join these to the aluminum cables in the next manhole with straight connectors designed for use between the 350 MCM copper and the 500 MCM aluminum conductors. Similarly the joints at the load ends of both lines, between the 500 MCM aluminum and 1/0 copper connections to the factory, are the combination aluminum-to-copper type shown below.

These combination connectors on both lines are made in two parts, one half copper, the other half aluminum. The halves are threaded, electro-tinned, screwed together, sweated, and pressed at the factory. The combination connectors are installed in the field with the usual hydraulic press, using zinc dust paste in the aluminum ends.


Aluminum to Copper 15 kv Combination Connector
Knurled indent guide lines
Before Installation
Tin plated aluminum barrel should be filled half full with zinc paste before installation
Tin plated copper tube
Copper cable
Aluminum cable
After Installation

COMBINATION CONNECTOR joins aluminum cable conductors to copper. Connectors are half aluminum, half copper, threaded, tin plated, screwed together, sweated, and pressed

Splicing Technique . . . The regular cable joints did not depart appreciably from the conventional design except for the connectors. Insulation is penciled by tearing tapes freehand. Protective wrappings are then applied until connectors are installed, and excess zinc paste is flushed away with hot oil. Removal of these wrappings follows and the pencils are carefully smoothed with abrasive cloth.

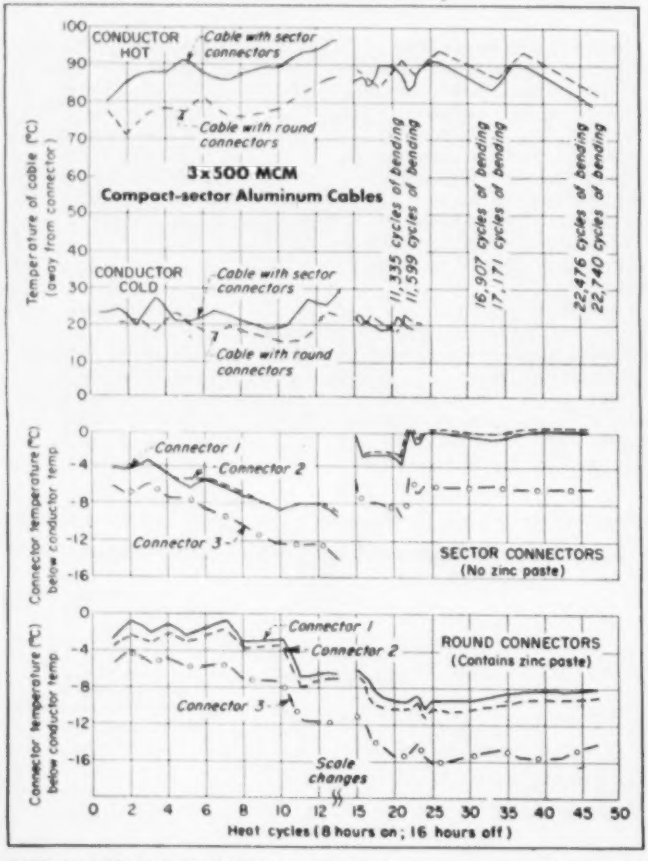
At this point a refinement is adopted prior to the field splicing work. One paper tape and the strand shielding tapes are left projecting ½ in. beyond the pencil or just into the ends of the connectors. After the pencils have been smoothed with the abrasive cloth, the single layer of paper tape is removed, having served its purpose in protecting the strand shielding tapes from the abrasive cloth. This leaves a tight wall of metallic tapes to prolong the path by which any residual zinc paste might in future reach the surface of the pencilled insulation. Snug taping and the smooth surface of the sanded pencils act as further barriers.

Clover Leaves Used . . . As an aid to keeping the three conductors separated while installing the connectors, wooden "clover leaves" are taped into the crotch of each cable. These permit forming the cable ends so that no difficulty is experienced in getting the head of the 40-ton hydraulic press into position on any phase. Equal spacing of the cable ends is also a great convenience when the three ends of the second cable are to be inserted together into three connectors and it is necessary to rotate one or both cable ends as a group to obtain alignment while maintaining proper spacing. The lead joint sleeve for the regular joints is 5.5 in. in diameter and 24 in. long, nearly the same as for a standard sweated copper joint.

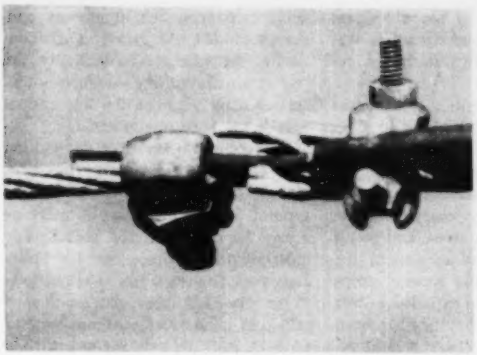
Pulling eyes were of the conventional oil-filled cable type. Although these required removal of one outer layer of strands on all three aluminum conductors, in order to fit the cable into the eyes, no difficulty was experienced or any distress shown after any cable was installed. Since any such distress would occur at the leading end of the cable where the conductors had been considerably reduced in section, there appears to be little doubt as to the practicability of pulling in such lengths of cable as previously described. Naturally, it must be assumed that modern well-constructed ducts, well-greased cable, and up-to-date pulling equipment and techniques are employed.

Increased Offset Required . . . New manholes for these lines are 5 ft wide and nominally 8 ft long but with cable bell mouths which result in 9 ft 4 in. between duct faces. Cable was racked in a plane 45 deg downward from the ducts. This provides about 20 in. minimum offset or a 40% increase compared to flat racking. This increase is of the same order as the increased motion of aluminum cable compared to copper cable during load cycles. In this connection a distinction should be made between lines which will carry peak load only on occasions when one line is out of service and those which are required to carry a heavy load cycle that is at, or very close to, full load regularly.

As mentioned, considerable accelerated testing was done to predict the long-time performance of these lines and joints. Among others were included tests of ac/dc ratio and interstrand contact in lengths of cable. Manhole bending tests under heating cycles were made to check permanence of joint conductivity. Dielectric strength, dielectric loss, and power factor tests were also made. Cyclic loading tests were made on sample connectors by the manufacturers.



TESTS OF 3-CONDUCTOR JOINTS show variations of joint temperature with heat cycles and manhole mending. Bending tests were made during heating cycles to check permanence of joint conductivity. Break in abcissa at 13 cycles was change from resistance to thermocouple type of temperature measurement



Atlantic City Electric Co

JOINT AT EDGE OF SALT MARSH 4 miles from ocean, using plain bronze, split-bolt connectors with no bimetal washers. These connections have been in service about 7 years. Here shown is a No. 4 copper primary phase connection over No. 2 ACSR conductor

Atlantic City Electric Co

CONNECTIONS OVER SALT MARSH 100 ft from edge of bay and 2 miles from ocean, using plain bronze, split-bolt connectors with no bimetal washers; in service 15 years. No. 4 copper primary neutral connection over armor rod of No. 2 ACSR neutral conductor

Wanted:
Information on Aluminum Connections

WANTED: For aluminum-to-copper electrical connections, a splicing method that will last as long as the conductors—and still maintain high electrical conductivity, when exposed to salt spray and industrial atmospheres. Price must be reasonable.

J. P. HAYWARD, Superintendent of Transmission and Distribution, Atlantic City Electric Co, Atlantic City, N. J.

Perhaps the failure of electric utilities to find a really satisfactory aluminum-to-copper electrical connector stems from the fact that until recently, we have not let our needs be sufficiently known. However, consideration of the findings of electric utilities in other parts of the country*, particularly in salt-water exposure areas, may help to define the magnitude of the problem.

The report presented here is confined to conditions existing within the territory of Atlantic City Electric Co, an area bounded on the west by the Delaware River, on the south by the Delaware Bay, and on the east by the Atlantic Ocean. Prevailing winds are off-shore, from the southwest. Terrain is predominantly flat and sandy.

Aluminum distribution conductors are freely used in the uplands regions where the connector problem is much less severe. To date, no corrosion-inhibiting grease has been used on any aluminum-to-copper connections of distribution lines; most of the connections are untaped, except at the house end of aluminum service drops.

That our connector problem is not more severe is probably due to the fact that occasional on-shore easterly winds usually bring rain which tends to cleanse exposed fittings of any salt deposits. The compression-type, aluminum-to-copper connection is expected to be the most promising, but considerable design work apparently remains to be done before a completely acceptable device is available. Meanwhile, care in line design will hold the number of aluminum-to-copper connections to a minimum, and the use of oxidation inhibiting greases, taping, or plastic spray coatings promises to lessen the severity of the problem.

Transmission Conductors—We have operated a 60-mile, double-circuit, 69-kv steel tower line, consisting of six 397,500 cir mil ACSR line conductors and two 159,000 cir mil ACSR ground conductors, for 20 years without any connector trouble. Most of the route is over high-grade farm land (short sections are exposed to industrial contamination near the Delaware River). A few sections are near fresh-water swamp-land. All conductor splices are compression-type treated with red lead.

A similar line (paralleling the 60-mile line for about 10 miles) has also

* Baugh, C. E. "Better Connector Life Vital to the Use of Aluminum in Distribution." Electrical World, June 2, 1952, pp 82-85.

ALUMINUM FOR DISTRIBUTION IS IT A BIG GAMBLE?

operated satisfactorily more than 20 years except for one splice failure at the point of connection to a copper circuit. Here an incorrect size of conductor was used which permitted the entrance of moisture so that the resulting corrosion eventually caused failure.

Two recently installed river crossings, operating at 69 kv, 1100 ft and 800 ft in length, consisting of No. 4/0 ACSR conductors, are equipped with aluminum compression deadends having copper-faced connector pads to accommodate copper in adjacent spans. Special precautions (a rope cradle in the case of the longer span) were taken during construction to avoid immersing the conductors in the tidal rivers. Also the conductors were first run through a bath of melted No-Ox-Id A, and the compression deadend bodies were filled with the same material. This was done because both crossings are within salt water spray range.

Distribution Conductors — One instance of long experience with all-aluminum conductor involved a dc trolley feeder, 19 miles long, running between 2 and 8 miles east of Delaware Bay. The conductor was installed about 1902 and consisted of 250,000-cir mil bare stranded aluminum installed with very short spans. Splices were hand-made. About 1916 the trolley system was abandoned, and the aluminum feeder wire was incorporated into the 2,400v, later the 4,160v, primary circuit. Connections and taps were copper tightly wrapped on the aluminum. No particular troubles were experienced and the aluminum conductor, still in good condition, was removed from service during a rebuild in 1951.

Aluminum distribution conductors used in Atlantic City Electric Co's system are bare No. 4 ACSR used for series street lighting and minor primary laterals in rural areas, bare No. 2 ACSR used for primary and secondary lines in rural areas, and No. 4 stranded insulated all-aluminum, the latter being used for service drops only. In general, our experience over a period of 15 or 16 years has been satisfactory, except where aluminum-to-copper connections are located within spray range of salt water.

Twisted parallel-sleeve splices are used for ACSR conductors; the recommended armor rods and aluminum taping are used where specified by Aluminum Co of America. Galvanized steel deadend fittings are employed throughout. Electrical tap connections were formerly made almost entirely of bronze split-bolt connectors with bimetal washers. Whenever, these split-bolt connectors and bimetal washers were within spray range of salt water—anywhere from a few feet to as much as several miles—we have experienced corrosion to a greater or less degree.

In numerous instances, in locations on the low, sandy, seashore-resort islands along the ocean, such connections have failed within 6 to 12 months because of the disintegration of the bimetal washers. Heavy accumulations of white powder form, often holding the conductors firmly mechanically but giving no electrical contact. In other instances, the aluminum conductor eroded and parted at the connector. Because of that difficulty, the use of aluminum line conductors and service drop wires on the low coastal islands has been discontinued.

Our oldest No. 2 ACSR distribution line was constructed about 1937. It operates at 2,400v, and extends from a point 5 miles inland to the edge of a bay 2 miles from the ocean. For most of the distance the line runs across open salt marshes. Connections to the line conductors were made with split-bolt connectors without bimetal washers, installed over the armor rods in most instances. Although partly in a salt-spray area, this line has given little or no trouble because of faulty connections. Accompanying illustrations show connectors still in service, some for 15 years.

Service Drop Conductors—Insulated No. 4, stranded, all-aluminum, service drop wire was used in widely scattered locations throughout the territory about 1944 and 1945 and again beginning in 1951. No connection difficulties have been experienced anywhere except within salt-spray areas where the usual split-bolt connector and bimetal washer have failed in anywhere from 6 months to several years. As a rule, the taping of the connection at the house end of the services retarded the corrosive action (see illustration), but rapid deterioration occurred at the pole end of the service. Frequent connects and disconnects required by seasonal seashore customers quickly showed the inadequacy of the aluminum-to-copper connection.

Atlantic City Electric Co

AT A SALT MARSH 3½ miles from ocean, No. 6 copper service drop wire has a connection over No. 2 ACSR secondary conductor, using a plain bronze, split-bolt connector with bimetal washers; in service about one year. Note corrosion at edge of washer

Atlantic City Electric Co

ON A NARROW SANDY ISLAND 800 ft from ocean, No. 4 neoprene, stranded all-aluminum service drop wire is connected to No. 6 stranded, copper S.E. cable conductor, using a bronze, split-bolt connector, bimetal washer, taped with friction tape; in service 7 years

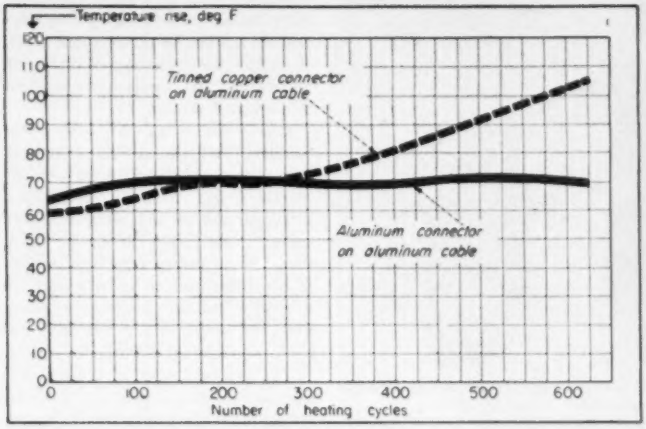


FIG 1—UNEQUAL TEMPERATURE RISE of aluminum connectors and tin-plated copper connectors of identical design when installed on aluminum cable is reflection of difference in expansion of copper and aluminum. In the load cycling tests the 1,000,000 cir mil cable was heated by 785 amp for four hours and then allowed to cool for three hours

FIG 2—PARALLEL-GROOVE CLAMP (top), and a compression-type connector (bottom) show contrast in bulk for the same size aluminum cable

The What, Why, and How Of Connections for Aluminum

Best aluminum connections are made with connectors specifically designed for the peculiarities of aluminum and installed according to recommended aluminum handling techniques

M. D. BERGAN, Director of Research, Thomas & Betts Co, Inc, Elizabeth, N. J.

Aluminum is different from copper in four ways that affect electrical connections: (1) In its oxide film, (2) in its thermal expansion, (3) in its physical tenderness, and (4) in its electrochemical polarity. Connectors for aluminum cable should be designed to suit these characteristics just as for years those for copper cable have been made to suit the characteristics of copper.

Aluminum Oxide . . . Aluminum oxide is a very poor electrical conductor. A bare aluminum wire which has been exposed to the air is insulated with an invisible, microscopic sheath of aluminum oxide.

In an aluminum cable of 37 strands with its three lays of 6, 12, and 18 strands around a central wire, there are for example, six thicknesses of oxide "insulation" between the outside lay and the center strand, and four thicknesses between the outside lay and the lay of six strands. Mechanical connectors make contact only with the outside lay of a stranded conductor. But if there is to be equal current distribution in the cable and the inner strands are to carry their share of the load, the oxide films between the lays of the cable must be broken down.

A connector can break through the oxide film on the outside strands mechanically. But it can force the inside strands into contact only if there is enough pressure to break down the oxide films between lays.

ALUMINUM FOR DISTRIBUTION

IS IT A BIG GAMBLE?

Oxide film imposes three requirements on a good aluminum connector:

1. Its conductor contact surfaces should be serrated or roughened for good contact.
2. It should exert sufficient pressure to break through the oxide films on the inner strands.
3. It should exert all-around pressure for uniform contact with all the strands.

Thermal Expansion . . . This characteristic is important when copper connectors are used on aluminum conductors. For the same increase in temperature, aluminum expands 38% more than copper. Similarly when aluminum contracts from a drop in temperature, it contracts 38% more than copper.

Continued cycles of heating and cooling loosen a copper connector on aluminum. Looseness between connector and conductor permits air, moisture, and contamination to enter and further deteriorate the joint.

Fig 1 shows how this action takes place. Here it is shown that the resistance of the copper connector increased with the unequal expansion and contraction until at the end of the

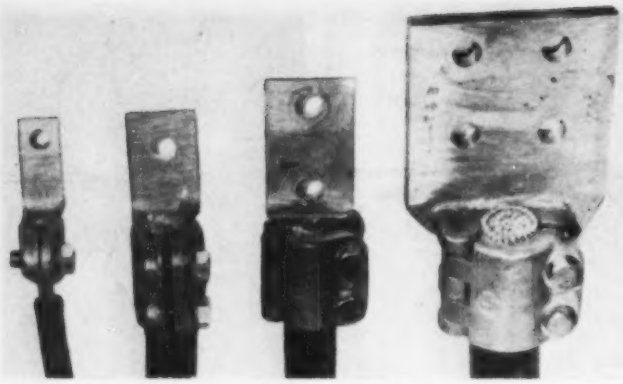


FIG 3—BOLTED LUGS designed for aluminum conductors. Hinge on one side of conductor socket tends to equalize pressure by screws on other side

test the copper connectors were operating 35 F hotter than similar aluminum connectors. Also it will be noted that the aluminum connector curve is practically a horizontal line, showing no deterioration during the test.

Aluminum connectors on aluminum conductors stay tight. They expand with the conductor and contract with it since there is no reason for them to relax their initial pressure. Thermal expansion simply demands that connectors for aluminum conductors be made of aluminum.

Physical Tenderness . . . Aluminum is particularly well adapted to forming by extrusion. Under severe pressure, it suffers plastic deformation.

Aluminum conductors are also comparatively soft. They can be nicked easily by a knife carelessly handled in removing insulation. Cable strands so nicked are likely to break when bent back and forth or vibrated at the damaged spot. In terms of connector design, the physical tenderness of aluminum requires that:

1. Connectors must have broad contact surfaces to distribute the pressure over a large area.

2. Connectors must apply all-around centripetal pressure to compress all strands equally.

Electrolytic Action . . . Aluminum is electropositive to copper. This means in practical terms that a copper connector and aluminum conductor bolted together have an electrolytic reaction in the presence of moisture. Rain or heavy fog makes a satisfactory electrolyte. Industrial atmospheres and salt laden moisture from the sea improve the electrolyte. A copper-to-aluminum joint becomes a short-circuited wet cell. As a result the aluminum anode is corroded by this electrolytic action and slowly eaten away. Naturally the efficiency of the joint suffers, and the connection is marked for eventual failure.

One solution to the electrolytic problem is tin plating. Tin is between copper and aluminum in the electromotive series. It is not so negative as copper and not so positive as aluminum. Consequently it serves as a buffer metal between the two metals. If aluminum cable is to be connected to copper bus, an aluminum terminal with the tongue tin plated may be used, minimizing electrolytic action.

The practical way to connect an aluminum with a copper conductor is not to allow the conductors to touch but to put both in an aluminum connector. The copper conductor may be separated from the aluminum connector by a thin copper sleeve heavily tinned inside and out.

Electrolytic action between aluminum and copper suggests that the most efficient connectors for aluminum be made of aluminum, and that copper-to-aluminum connectors be aluminum, tin plated.

Connector Types . . . There are four types of connectors that are generally used today, some very similar to their copper counterparts:

1. Set-screw type that applies pressure to the conductor by means of a screw bearing directly on the conductor or on a saddle which presses on the conductor. Uniform all-around pressure is not applied.

2. Clamp type with conductor socket which partly closes around the conductor by screw pressure. These may be terminal lugs, parallel-groove clamps, butt splicers, or split-bolt connectors minus all-around pressure.

3. Twisted sleeve type of connectors or splicers.

4. Compression sleeve type consists of a close-fitting sleeve compressed on the conductor under great pressure.

Set-screw connectors are not recommended for aluminum connections. A set screw bearing down directly on aluminum cable is apt to "chew" the strands. When a saddle is put between the set screw and the cable the pressure between the saddle and the socket is on only a few strands at the top and a few strands at the bottom. Oxide film on the strands at the sides remains intact. Those strands offer high

A Good Connector for Aluminum Conductor Should:

Because of the oxide film—

1. Have a serrated or roughened conductor contact surface.
2. Exert enough pressure to break down the oxide film.
3. Exert all-around pressure.

Because of thermal expansion—

4. Have the same coefficient of expansion as aluminum cable.

Because of physical tenderness—

5. Have broad contact surface.
6. Exert all-around pressure.

Because of electrolytic action—

7. Be made of aluminum or
8. Be tin plated (if used in copper in the presence of moisture).

resistance, carry little current.

Bolted-clamp connectors that are carefully designed are more satisfactory than the set-screw type. Fig. 2 shows such a clamp type connector—a parallel-groove clamp tightened by screw pressure. It has large contact area, and oxide-breaking pressure is exerted on the conductors.

Another form of clamp type connector is the bolted lug, Fig. 3. Only conductor sockets designed for one conductor size can produce uniform pressure on all strands of that cable.

The split-bolt type, a variation of the bolted-clamp connector, employs a brass or copper-alloy fitting to clamp one conductor on top of another. An aluminum saddle is sometimes sandwiched between the conductors. Using brass or copper on an aluminum conductor invites electrolytic corrosion. But the basic disadvantage of this kind of connector is that two conductors placed one on top of the other present only meager contacts to one another instead of the broad, large area contacts necessary for good aluminum connectors.

Twisted-sleeve connectors give more longitudinal contact between the two conductors. However, the pressure exerted on the conductors is not nearly so great as in a bolted-clamp type. Moreover, the pressure depends rather on the weight of the conductor in the span than upon any force exerted by the twisted sleeve itself. This connector is not very effective in breaking down the oxide film on the cable nor in preventing its re-formation.

Compression sleeve type connectors are in many ways ideally suited to aluminum cable. They afford large areas of high pressure contact without excessive bulk. Fig 4 shows a cross section view of a connector and cable before compression and superimposed on it the finished hexagonal compression. Arrows indicate the uniform all-around pressure on the cable. All of the strands have been compacted into intimate relation with one another, and the connector is practically a part of the cable. The oxide film is broken down, and there is little chance of its reforming.

Perhaps compression aluminum connectors are more often identified as part of transmission lines, where they have been used for years; but they are also made for distribution use. The middle fitting in Fig 5 is an aluminum compression splicer joining two aluminum cables of same size.

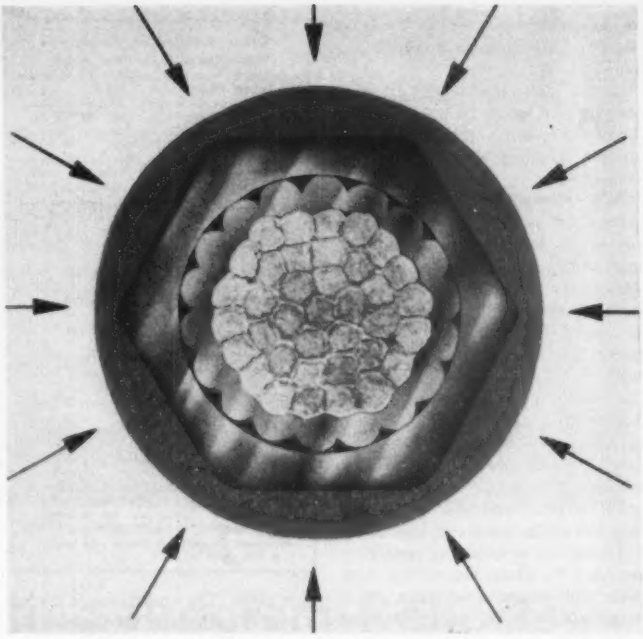


FIG 4—COMPRESSION CONNECTOR before and after compression. Arrows indicate how round connector is compressed into a hexagon. At the same time aluminum cable strands have been compressed into a solid with no air spaces

Above it is another aluminum compression splicer connecting aluminum cable on the left with copper cable on the right. Inside the right end is a tin copper sleeve, tinned inside and out. This sleeve completely separates the copper cable from the aluminum splicer and minimizes the possibility of electrolytic action between the two dissimilar metals. At the bottom there

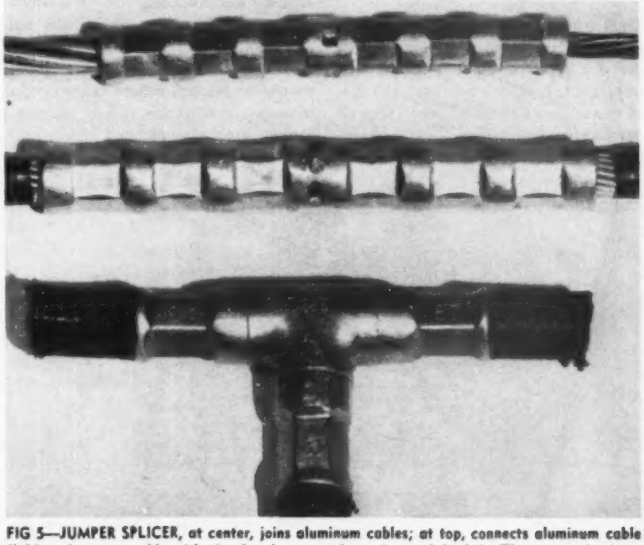


FIG 5—JUMPER SPLICER, at center, joins aluminum cables; at top, connects aluminum cable (left) and copper cable with tin-plated copper sleeve inserted (right). Three-way aluminum compression splicer (bottom) makes taps from aluminum conductors

is a compression tee-tap made of aluminum for use on stranded aluminum cable.

Fig 6 shows an installation of a jumper loop splicer on a transmission line. The lineman is guiding the hydraulic installing head for the final compression.

A tension splicer for ACSR has two parts—the steel splicer to be compressed on the steel core of the cable and an aluminum sleeve to be compressed over the conductors. Normally the space around the steel splicer is filled with oxide inhibitor compound which is injected in a filler hole.

A deadend fitting for ACSR conductors has a steel clevis and compression sleeve which hold the steel core independently of the aluminum strands. A continuous aluminum tube grips the span end and the jumper loop end of the aluminum conductor.

Splicer and terminal lug connectors are used on aluminum service drop cable and similar small sizes. They consist of a split, round, tapered cable grip made of copper and a tapered bronze ring. They are completely tin plated. The bronze ring is forced up over the tapered cable grip by a plier type tool, and holds the aluminum cable under constant spring compression. Such constant spring pressure allows for the different expansion rates of copper and aluminum.

Underground Service . . . Aluminum compression splicers are used on both the dry type of cable and the oil-impregnated type where other kinds of connectors cannot be used. One of the recent applications is on a three-conductor, compact segmental aluminum cable. The uncompressed splicer is oval to conform to the shape of the conductor. A 20-ton hydraulic installing head is used to compress the splicer on each conductor.

Other Articles on Aluminum
From Issues of Electrical World

Insulated Aluminum as a Conductor—A Special Report, Sept 13, 1947
Application of Insulated Aluminum Wire and Cable, p 104-113, Sept 13, 1947
Voltage Drop Charts for Insulated Aluminum Cable, p 114-117, Sept 13, 1947
Aluminum Busbar Lugs and Joints Need Not Be Large, p 118-119, Sept 13, 1947
Tennessee Utility Adopts Aluminum for Distribution, p 64-66, Feb 28, 1948
Aluminum Conductors Used Exclusively in New Rolling Mill, p 81-84, April 24, 1948
Aluminum and Copperweld-Copper Cable Data, p 118, Nov 20, 1948
The Pinch Is in Metals, p 137, May 21, 1951
Metal Situation; Better or Worse? p 30, June 25, 1951
Revolution Taking Place in Electrical Conductors, p 21, Sept 3, 1951
Materials Outlook, p 116, Sept 10, 1951
Hot Line and Parallel Groove Clamp Taps on ACSR, p 124, Oct 22, 1951
Use More Aluminum; Less Copper, p 7-8, Jan 7, 1952
Let's Decide to Like Aluminum, p 85-88, Jan 14, 1952
The How-To of Aluminum in Distribution, p 97-100, Feb 11, 1952
Better Connector Life Vital to Aluminum in Distribution, p 82-85, June 2, 1952
All-Aluminum Conductors for Overhead Line Construction, p 90, June 30, 1952
Aluminum Conductor Deadends and Splices, p 154, July 14, 1952

Tips on Installation . . . A newly made joint on aluminum cable does not reveal its quality immediately. There is no easy electrical test which will identify a good connection. Consequently, it seems only practical to follow those installing practices which have been giving good results on aluminum for many years.

In general an aluminum cable should be cleaned before a connection is made. If the cable is new and reasonably free of aluminum oxide, perhaps the cleaning can be omitted. The provident thing to do is to clean the aluminum conductor:

1. Smear the cable end with an oxide inhibitor compound.
2. Wire brush the cable or scrub with emery cloth right through the inhibitor compound. Some utility crews unstrand dirty cable to clean all the strands.
3. Leave the compound on the cable to prevent the oxide film from again forming.
4. Then insert the cable into the connector. After the connector has been tightened, the compound will fill the crevices and seal out air and moisture from the contact surfaces.

The contact surfaces of bus bar and the lugs to be bolted to it should be wire brushed with compound every time a connection is made. (If aluminum lugs have been tin plated for use against copper bus, the tin plating should not be wire brushed. Clean the copper bus. Put a coating of oxide inhibitor compound on either the lug or the bus bar.) As a matter of fact, copper-to-copper connections are greatly improved by being cleaned and coated with compound.

When the aluminum cable has rubber insulation, the inhibitor compound should be carefully wiped from the insulation. Petrolatum base compounds cause rubber to deteriorate. It does no harm to paint a finished joint—connector, conductor, and insulation—with zinc chromate primer. The insulation should be pared off, as you would sharpen a pencil.

Use large flat aluminum washers between the lug tongue and the nut that holds it. They will distribute the pressure and prevent scoring. The bolts that hold lugs to bus and the bolts that hold the cable clamps in bolted fittings should be drawn up tight.

Finally, consider electrolysis. Whenever it can be done, put aluminum connectors on aluminum cable. Where it is imperative for copper and aluminum to be connected, use tin-plated aluminum terminals if there is any possibility of moisture reaching the joint. On a line splicer between copper and aluminum, try to keep the aluminum end higher than the copper end because aluminum salts that drain down over copper will not affect it; but copper salts draining over aluminum will cause corrosion. Simple installing precautions pay off in permanent, trouble-free aluminum connections.

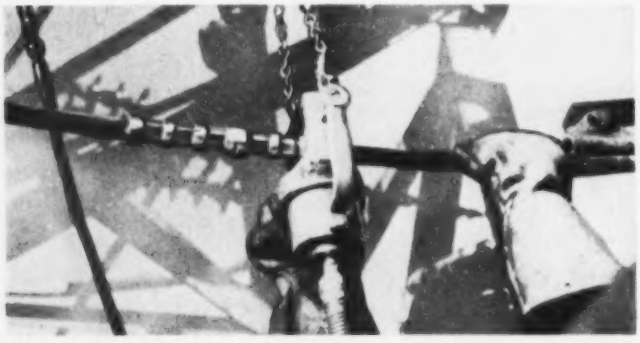


FIG 6—FINAL COMPRESSION is being made on an aluminum jumper splicer. Hydraulic installing head has hose running up to pump operated by second lineman on tower

PRESIDENT'S BADGE is passed by F. O. McMillan, right, to his successor D. A. Quarles, who will become AIEE president on Aug. 1

Summer Meeting Program Reflects Broadened AIEE Interests

Non-technical topics devoted to engineering manpower, atomic power generation, and management are linked with technical topics ranging from transformer testing to carrier current and electronics

Within the next five years atomic reactors will be built on a large enough scale to afford dependable and significant cost data for power generation. This was the prediction L. R. Hafstad of the Atomic Energy Commission made at the summer general meeting of the American Institute of Electrical Engineers. The meeting was held June 23-27 at Minneapolis.

Hafstad said that the four groups of utilities and industrials engaged in atomic research are continuing their studies begun a year ago. In ten years the power program might well be able to stand on its own feet.

Electronics, supersonics, and nucleonics place an entirely new responsibility on the engineer, President-elect D. A. Quarles (EW, June 30, p 62) asserted. Electrical engineers must expand and function effectively in the new divisional setup of AIEE. He cited the recent formation of Science and Electronics and Nucleonics Committees as evidence of the institute's policy of broadening its base to really cover its technical field.

Silver Gets Lamme Medal . . . Lamme Medalist A. E. Silver, retired from Ebasco Services, traced the evolution of rural electrification from the beginnings on the West Coast in 1898 through the activities of the National Electric Light Association and the Committee for Relation of Electricity to Agriculture to the development of the simplified line and transformer.

These reduced costs and paved the way for the expanded program of both utilities and the REA in the thirties. In offering Silver as the medalist, F. S. Rice, Minnesota Power & Light Co, had credited to him these and other developments.

To Be Supervisor an Engineer Must Prepare . . . An engineer who wants to be a supervisor better make up his mind and then prepare for the task and the usually enlarged rewards. This was the warning of E. W. Seeger, Cutler-Hammer. At first his superior engineering knowledge will be paramount. But as he progresses into policy, organization, and other responsibilities, he will assign his engineering responsibilities to others. Failure of engineering supervisors are seldom due to want of technical knowledge or ability but more often to lack of interest in the job of supervision.

Competent engineering management is imperative as insurance toward preservation of the free society evolved in America, T. M. Linville, General Electric Co, said. He rated leadership as a dominant factor toward getting people to act cooperatively without command. Wherever it slips the enterprise falls short of full achievement.

Math Scares Them Away . . . The stress on higher mathematics in curriculum discussions with prospective engineering students may be scaring

LAMME MEDALIST A. E. Silver, right, gets the award from Pres F. O. McMillan. The former Ebasco engineer pioneered rural electrification

PRIZE PAPER WINNERS Richard Grantages, S. C. Killian, and Frank D. Olney with P. A. Cartwright and District Vice-President J. R. North

away good prospective talent from the profession. This guess was hazarded by J. H. Foote, Commonwealth Services, in a discussion of the shortage of engineers. It was pointed out that more high school students must be encouraged to study engineering and that as much work must be done with their counsellors as with the students.

Career days have been an effective way of reaching pupils and teachers, several speakers asserted. Such occasions provide an opportunity to explain the benefits of specialized education and engineering careers to outstanding students and their teachers.

• • •

DC Tests For Insulation Popular

Field Studies of Generator Windings. H. C. Marcroft, *Pennsylvania Water & Power Co*

Ac and dc instantaneous breakdowns at same potential. Dc irregularity may warn of breakdown. Polarization Index valuable in determining overall insulation condition. Turn-to-turn shorts not disclosed by resistance tests. Power factor test to detect corona damage.

DC Over-Potential Testing Experience on High Voltage Generators. R. J. Alke, *Westinghouse Electric Co*

Basic advantages over ac found; for less damaging and time of application less critical; test set conveniently small.

Interlaminar Insulation Test for Synchronous Machine Stators. H. R. Tomlinson, *New England Power Service Co*

Requires merely test winding to magnetize core; half the volts per turn of main winding. Temperature rise of damaged core area will become excessive.

The Re-examination of Temperature Standards for Electrical Insulation. G. L. Moses, *Westinghouse Electric Corp*

Advent of man-made molecules vibrates the old organic-inorganic criteria. Functional use (dielectric barrier, physical separation, and physical support) should also be recognized.

Proof that high voltage d-c testing of generator insulation has become firmly established was evident in both papers and discussion at this session. The day is nearer when insulation life and insulation failure can be inferred quite definitely from the test. As G. L. Hill, Pacific Gas & Electric put it, so much investment is at stake in breakdowns and repairs that the test procedures are becoming recognized as economically valuable. Manufacturers reported addition and substitution of d-c testing in production control and utilities have likewise been applying it to varying degrees. However the anomalies are by no means resolved and plenty still needs to be done to reconcile test methods and test results as long as the mechanism of dielectric breakdown is incompletely understood. So-called "runaway" phenomena associated with accelerated current rise with increased voltage appear to be the prime index of incipient weakness and impending failure. Cleanness and dryness affect the results, Hill admitted and along with losses and leakage must be taken into account.

Excitation Systems Discussed

Development of a Modern Amplidyne Voltage Regulator for Large Turbine Generators. W. A. Hunter, M. Temoshok, both *General Electric Co*

Traces regulator development showing how it led to the modern rotating amplifier type regulator for the turbine generator, which combines a rotating amplifier with static control circuit. Describes operation and advantages it offers in improved voltage and reactive control and extension of machine stability limits.

Effect of a Modern Amplidyne Voltage Regulator on Underexcited Operation of Large Turbine Generators. W. G. Heffron, R. A. Phillips, both *General Electric Co*

Shows the steady-state limits of steam turbine generators achieved by using a standard, commercially available, continuously-acting regulating system. Compares these limits with those of regulators having deadband. Shows degree of improvement.

Operating Experience with Shaft-Driven Exciters in Air and Hydrogen. F. M. Porter, H. B. Margolis, both *American Gas & Electric Service Corp*

Survey of operation and maintenance of 72 shaft-driven or direct-connected exciters installed on AG&E system since 1917 shows satisfactory experience. Gives no reason to consider use of special excitation schemes aimed at eliminating commutator and brush difficulties.

Opinion expressed on the discussion was that there are three ways to realize benefits of modern regulators: 1. Through lower short circuit ratio, 2. higher external reactance, 3. by carrying more under-excited reactive kva.

It was agreed in the discussion that the fine maintenance program, particularly preventive maintenance, contributed much to the good operating results reported.

SHORTAGE OF ENGINEERS was discussed by these experts: Prof R. H. Cole, left, Northwestern University; J. H. Foote, president, Commonwealth Services, Inc; H. A. Dambly, Philadelphia Electric Co; Carey H. Brown, chairman, Engineering Manpower Commission of the Engineers Joint Council; and S. Paul Shackleton, Committee on Student Guidance of Engineers Council for Professional Development

Study Polyethlene Performance

Artificial Cooling of Power Cable. F. H. Buller, *General Electric Co*

Calculations based on procedures described show that for 3,000 ft pipe cable and 1500 ft tunnels, improvement in cable rating can be had by forced ventilation in forced oil circulation without using circulating equipment so costly it offsets lower cable cost.

Rapid Measurement of the Thermal Resistivity of Soil. V. V. Mason and M. Kurtz, both *Hydro Electric Power Commission of Ontario*

Thermal resistivity of soil measured by thrusting a long heated needle deep into ground and measuring its temperature at ½ minute intervals for 15 to 30 minutes. Slope of resulting temperature vs time curve on semi-log paper is proportional to thermal resistivity of soil.

Weathering and Crack Resistance of Black Polyethylene for Wire and Cable. W. A. Haine, E. F. Smith and N. R. Smith, all *Union Carbide and Carbon Corp*

Cracks and splits in polyethylene cable sheaths traced to stresses applied in installation in presence of cable pulling greases or pressure testing soap. Can also be created by large variety of chemical environments. Paper presents other data, cites controlling factors, and describes significance.

Guide For Temperature Correlation in the Connection of Insulated Wire and Cables to Electrical Equipment. *AIEE Project Committee on Temperature Correlation*

Suggested remedial measures for solving problems of correlating the temperature of electrical equipment with that of insulated wire and cable connected to it. A guide to cable termination practice.

Surface Discharges from Cable Sheaths and Their Relation to Electric Shock. E. W. Greenfield, *Kaiser Aluminum & Chemical Corp*

Data showing amount of current flowing to ground over a range of body contact resistances for non-shielded, metallic-shielded, and semi-conductive, jacketed, rubber-insulated aerial cables operating at various voltage levels. Body currents from cables tested were mostly below shock sensation level near milliampere.

Several basic questions were raised about polyethylene as an insulating material in spite of the admittedly superior initial properties. One was age deterioration either at the surface or by cracking. The answer was not readily available. Another question was directed at the apparently exclusive use of carbon black pigmentation in polyethylene to improve weathering life. Carbon black has the highest opacity of any substance known and can be bought commercially. A third question was with regard to undisclosed extruding methods used by manufacturers.

It was agreed that some troubles have been experienced but that polyethylene is very rugged and has given good service.

Surface discharges of cable sheaths may have considerable to do with failures in the opinion of E. W. Davis, Simplex Wire & Cable Co. He suggested that discharges at duct mouths may cause failures.

D. W. Taylor, Public Service Electric & Gas described a cable cooling installation at one of their plants. To determine relative merit, air blown through a tunnel carrying cables was used to cool three pipe type cables. One cable was oil cooled. Results have been satisfactory with both.

System Engineering Development

Installation of a million kva of synchronous condensers on the Southern California Edison system and automatic division of the system into two, three or four sections under out-of-step conditions were described in a conference paper by C. R. Canady. System separation is performed by three installations of out-of-step type automatic separation equipment. Condensers are preferred to capacitors, Canaday said, because response to a sudden change in system voltage is always corrective while response of a static capacitor is always wrong.

Alexander Dovjikov, Bonneville Power Administration, suggested other possible ways of accomplishing the results described by Canaday, such as quick switching of capacitors from delta- to wye- connection to increase voltage or changes at hydro or steam plants or both.

Centralized control of electric water heaters reduced peak loads in the Minnesota Valley Electric Power Cooperative system 20%, according to figures reported by Lincoln Rietow, Control Corp, and H. A. Schimelpfenig, of the Coop. Peak load was 1,000 kw and removal of the water heaters took off 200 kw. When they were returned to service 3 to 3½ hours later, load pickup was 300 kw and the scheme used for control cycled the water heaters on and off at five minute intervals until the system load dropped enough to return them to continuous service. Water heater load can be removed from service at any time that it is desired.

AT T&D SESSION are speakers J. G. Anderson, left, and I. B. Johnson, General Electric, and J. T. Brosnan, Niagara Mohawk

AT CARRIER CURRENT SESSION are G. E. Farmer, TVA; C. W. Boadway, Ontario Hydro; and Ted Talmage, Kellogg Switchboard

Distribution Systems

Transient Fault Current and Voltage Recovery Characteristics of Distribution Systems. Joint Subcommittee

Four-wire multi-grounded neutral primary circuits analyzed and other systems deduced therefrom. Recovery studied on co-op rural system. Limits suggested for prospective standardization of protective apparatus.

A Passive Compensator for Voltage Flicker. Paul A Cartwright, *University of Minnesota*

Center-tapped transformer (no moving parts) compensates for voltage drop caused by starting a motor.

Some Observations on the Economic Benefits in Going from One System Voltage Level to a Higher System Voltage Level. D. K. Blake, *General Electric Co*

Load area average definitely increases on a cost-per-kva basis as the voltage increases. All gains must be achieved in feeders and substations: 12 kv most beneficial when initiated at light load density. Non-uniformity of area favors 12 kv over 4 kv. Outages more and longer at higher voltage.

Lightning to the Empire State Building—Part III. J. H. Hagenguth and J. G. Anderson, both *General Electric Co*

250-amp continuous current common. Half the strokes exceed 19 coulombs and 0.27 sec duration.

Whether the report of the joint subcommittee was applicable to the 14/24 kv systems of the REA was queried by L. S. Crann. But he was assured that it did by I. B. Johnson, General Electric Co, who presented the report. That the treatment did not differentiate adequately between expulsion fuses and sectionalizing devices as to recovery voltage was also expressed. But assurance was given on this point also. Chairman R. L. Witzke, Westinghouse, said the committee had made numerous assumptions but that indicated values for transient current and recovery voltage were on the severe side of the average but not the ultimate in severity.

Reclassify Transformer Insulation?

Relation of Transformer Design to Fire Protection. E. D. Treanor and L. C. Whitman, both *General Electric Co*

Insulating materials used in transformer manufacture were tested for flammability, burning rate, inflammability of vapor, and chemical content of decomposition products.

Dielectric Measurements on New Power Transformer Insulation. W. L. Teague and J. H. McWhirter, both *Westinghouse Electric Corp*

Tests relating power factor, insulation resistance, and dielectric absorption characteristics were aimed at evaluation of measurements using different test methods.

1,100,000-Kva Short-Circuit Transformer in the New High-Capacity Switchgear Laboratory. B. A. Cogbill, *General Electric Co*

Special characteristics required of large testing transformer are not necessary to standard transformer. Standard transformer characteristics not essential to test unit. Required special design and construction. Gained information, relating particularly to short circuit forces, that will be useful in designing and building standard transformers.

The Production Impulse Testing of Distribution Transformers. E. D. Treanor, H. C. Stewart, and J. E. Holcomb, all *General Electric Co*

Automatic assembly-line impulse tests performed on distribution transformers to detect many types of defects. Function as invisible inspector and final check on manufacturing operation.

A Solution of a Common Insulation Problem. Dr G. I. Cohn, *Illinois Institute of Technology*, and F. J. Vogel, *Allis-Chalmers Mfg Co*

Mathematical formulas developed for the solution of problems involving breakdown or corona voltage in the design of transformers and other equipment.

Discussions of the paper on the Relation of Transformer Design to Fire Protection by L. C. Whitman indicated a feeling that there should be a reclassification of transformer insulation materials. M. L. Manning of Pennsylvania Transformer Co questioned data presented by Whitman with regard to the asserted 56% of combustible gas and the burning characteristics of Class H insulation. Heat cleaning of glass fibers or asbestos he said removed binders and lubricants which will decompose at 220 C and final cure removed volatile in impregnating varnishes. Class H materials treated in this manner will not support combustion he said, adding the opinion that tanks properly designed and with relief devices should then withstand the possible resulting pressures.

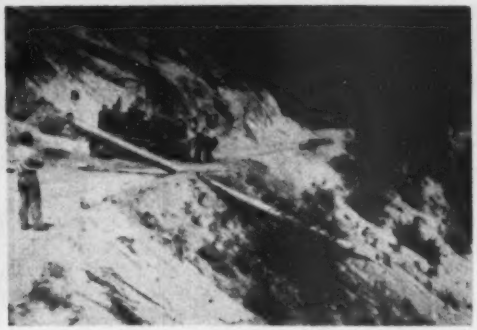
M. I. Alimansky, General Electric, said the stream of new developments provides a great variety of new materials that can't be pigeonholed. Old classifications are no longer adequate and a new basis for classification is needed.

In discussion of the Teague-McWhirter paper A. L. Horelick of Pennsylvania Transformer Co described another power factor test this company has used. Measurements are made on coils during the varnish baking period in order to determine curing period in the oven. Power factor testing, he said, provides a guide to quality control, drying out and final test before shipment. Commenting on power factor versus resistance testing, Horelick said, that power factor testing has proved more valuable throughout the processing of transformers, including final tests before shipment.

E. B. Curdts, Biddle Co, believed resistance ratios used in the paper are not practical. He recommended reversed polarity measurements in the d-c tests on completed transformers as a means of getting further useful information. The guard connection of the test instrument, in the d-c tests on

(*Continued on page* 236)

CONCRETE POURING at tower sites was speeded up by this sled which carried 16 cu yd per trip. Ramp was built on an angle to aid unloading



TOWER STEEL made the trip from access roads to tower sites in this 36-ft sled. A similar but shorter sled was used to carry line hardware

Material Sleds Speed Tower Line Construction

HERBERT HOLLIS and **J. C. ROMEL**,
General Construction Dept, Pacific Gas and Electric Co, San Francisco

Three material sleds designed and built by Pacific Gas and Electric Co cut the cost by at least one-half and substantially reduced the time and labor force necessary to complete 58 towers on the Rock Creek-Oroville, 220-kv transmission line. The sleds carried concrete, tower steel and line hardware from access roads to tower sites. Their use made unnecessary the building of 56 tramways which would have averaged 450 ft in length.

Also eliminated was the building of temporary roads. This construction would have endangered two energized tower lines, a busy state highway, and the Western Pacific rail lines in the canyon below by the possibility of rock and dirt slides.

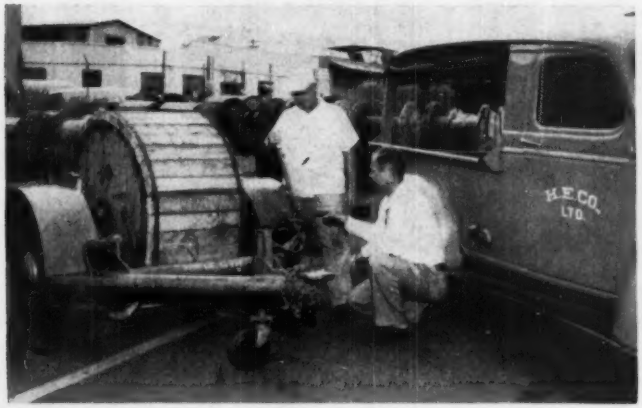
Sleds were steel cylinders with steel cones at each end. Concrete was hauled in a sled 16½ ft long and 18 in. in diameter, consisting of a 12½-ft cylindrical portion made from ⅜-in. plate and welded to cones of ¼-in. plate. The cylinder was capped with ⅜-in. plate at both ends.

Hatch doors about 10 in. wide at each end of the cylinder were held by cam locks on one side and steel dogs on the other. Loading door was 24 in. long; unloading door, 9 in. long. This arrangement permitted loading and unloading of concrete in a minimum time. The sled weighed about 1,140 lb and could carry about 16 cu yd of concrete.

Sleds for carrying tower steel and line hardware were made in a similar fashion but were 21 ft long, 18 in. in diameter, and 36 ft long, 20 in. in diameter. Their hatch doors were 14 in. wide and ran the length of the cylinder. These sleds weighed in excess of 1,650 lb and were designed to carry a pay load of about 2,500 lb.

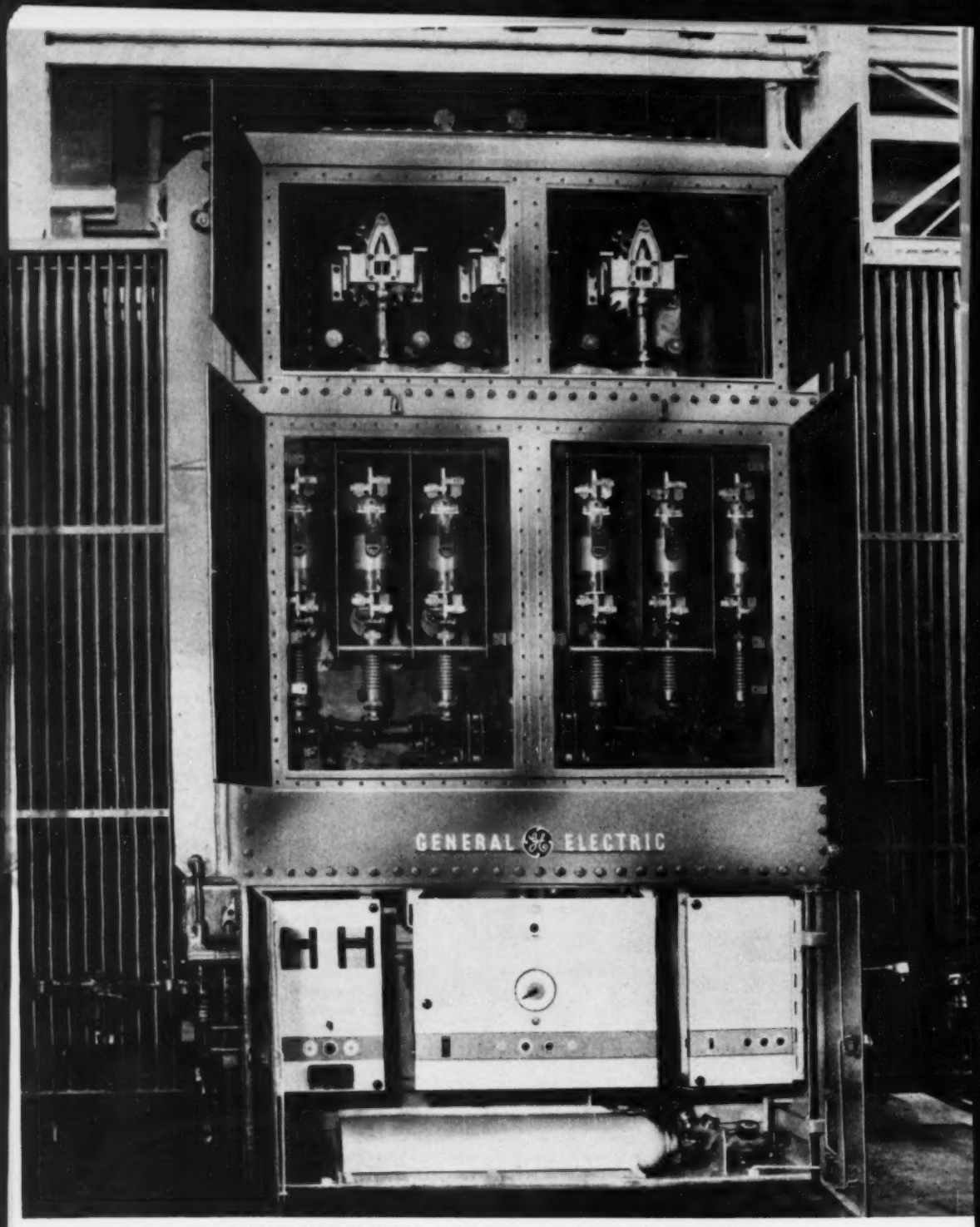
Cold rolled steel stock, 3 in. in diameter and drilled with three holes, was welded to both ends of the sleds to provide a means for attaching the hauling cables. Ball-bearing swivels were placed between each end of the sled and the cable to provide freedom

(*Continued on page 150*)

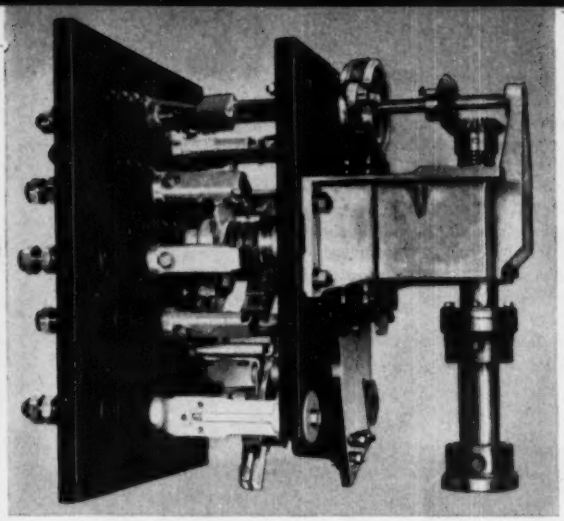


Hydraulic Lift Improves Reel Handling

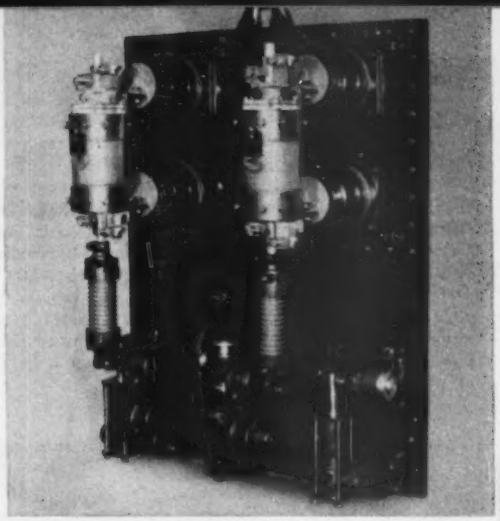
The job of loading cable reels onto trailers has been cut from a five-man operation to a fairly simple, one-man operation by the use of this hydraulic lift trailer. The trailer has an A-frame similar to the one on the old cable reel trailers, but with the addition of a hydraulic ram and a set of lifting arms that pick up the reel and place it into an elevated position. Spring-backed pins then lock in place once the reel is mounted so as to make it secure without hydraulic power. A second ram at the head of the A-frame can raise or lower the towing pintle to just the right height needed to hook onto the truck. The trailer was designed by E. V. Schoenberg of the Hawaiian Electric Co in Honolulu at a cost of about $750.



RUBBER-GASKETED DOORS of this heavy-duty equipment swing open on hinges to reveal the complete accessibility of G-E Load-Ratio-Control. Tap selectors and oil-blast contactors are located in upper and center oil-filled compartments. Air-filled compartment below houses the control center, including motor drive with automatic control, fan control and automatic gas-seal equipment.



TAP SELECTORS are mounted on Herkolite* panels. Transformer tap leads are connected to the backs of the bushing studs eliminating cabling from the compartment. The movable tap selector fingers consist of two parallel bars held in contact with stationary tap shelves by a strong compression spring.



HEAVY-DUTY CONTACTORS utilize oil-blast principle of arc interruption. Accelerator springs assure rapid separation of contacts inside the Herkolite cylinders. The arc is extinguished by pressure which builds up and expels oil and gases through small port. Insulating shafts are corrugated to lengthen creepage paths, increase insulation life.

Inside Story: G-E LOAD-RATIO-CONTROL

Over 39,000,000 installed kva have proved it's as reliable as the transformer itself

This "transformer reliability" results from the complete co-ordination of the four basic factors of load-ratio-control design:

MECHANICAL LIFE. Each new LRC design must pass mechanical-life tests of some 2,000,000 operations—the equivalent of 30 to 40 years of normal service—before we approve it for production.

ARCING-TIP LIFE. Superior arc-resistant qualities are achieved with a tungsten-base alloy. We also test the contacts of each design so that you will know, accurately, when the arcing tips on your equipment will need to be replaced.

INSULATION LIFE. By using vertical insulating surfaces and electrostatic shielding to minimize the effects of oil carbonization, we co-ordinate insulation life and arcing-tip life. This means you have to clean insulation only when you replace the arcing tips.

NORMAL AND SHORT-CIRCUIT DUTY. Each contactor design has been thoroughly tested to define its safe limits of duty under these conditions. Mechanisms are applied to handle the maximum rupturing duty which would be imposed should a short-circuit occur while a tap change is in process.

The co-ordination of these basic design factors in G-E load-ratio-control assures you long service, longer periods between inspections, and less maintenance.

MODERN LOAD RATIO CONTROL . . . a factual slide presentation . . . contains more detailed information on load-ratio-control. A G-E Transformer Specialist would be happy to show it at your request. Contact your nearest G-E sales office, or write General Electric Company, Schenectady 5, New York. 401-30

*Reg. trade-mark of General Electric Company.

14 YEARS OF TAP CHANGES without any servicing—that's the prediction for this Indianapolis Power and Light unit—made possible by the co-ordination of insulation and arcing-tip life in G-E Load-Ratio-Control.

GENERAL ELECTRIC

Sleds Speed Work

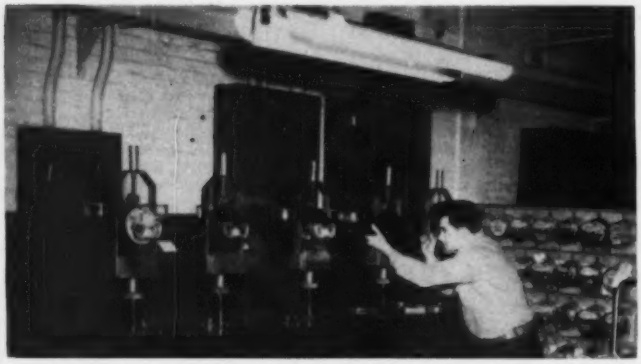
(*Continued from page* 147)

to roll without twisting the cables.

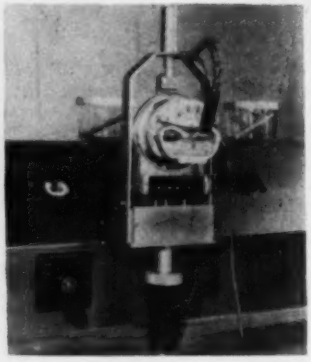
Because the sleds could be dragged along the ground, no rigging mast was necessary and there was no need for transporting and setting up a large amount of rigging equipment. To set up the cable rigging for the concrete sled, tackle was hauled manually to the tower site and attached to a tree or stump above and to one side of the site. About 15 ft above and to one side of the site a heavy timber ramp was built on which to slide the sled. The ramp was at an angle of about 15 deg.

Cables were drawn through the ramp to blocks above. As a loaded sled was hauled up the slope to the ramp it was turned with a large wrench to position it for unloading. After the sled was on the ramp, concrete was unloaded from the lowest door into the wood chute leading to the foundation holes. Time for loading 16 cu yd of concrete took about 7 min, the trip to the site varied between 3 to 8 min, and unloading took between 5 and 15 min.

Occasionally cylinders became worn or damaged due to rough terrain, although the usual failure occurred where the cones were welded to them. Damaged cylinders were rewelded and reinforced in local blacksmith or machine shops. It was estimated that the sleds carried 770 cu yd of concrete, 560,000 lb of tower steel, and 70,000 lb of insulators and hardware.



FIVE AT A TIME is the way this test board handles watthour meters. In addition to adapter mountings, which are pneumatically operated and swivel 90 deg, board features 5 to 50-amp current supply; push button revolutions counter; stroboscopic equipment



ADAPTER MOUNTINGS will handle any two or three-wire meter, ranging from old 1914 to present-day models, including socket types

Test Board Handles Meters Five At a Time

N. B. PHILLIPS, Supt of Meters and Tests, Niagara Mohawk Power Corp, Buffalo, N. Y.

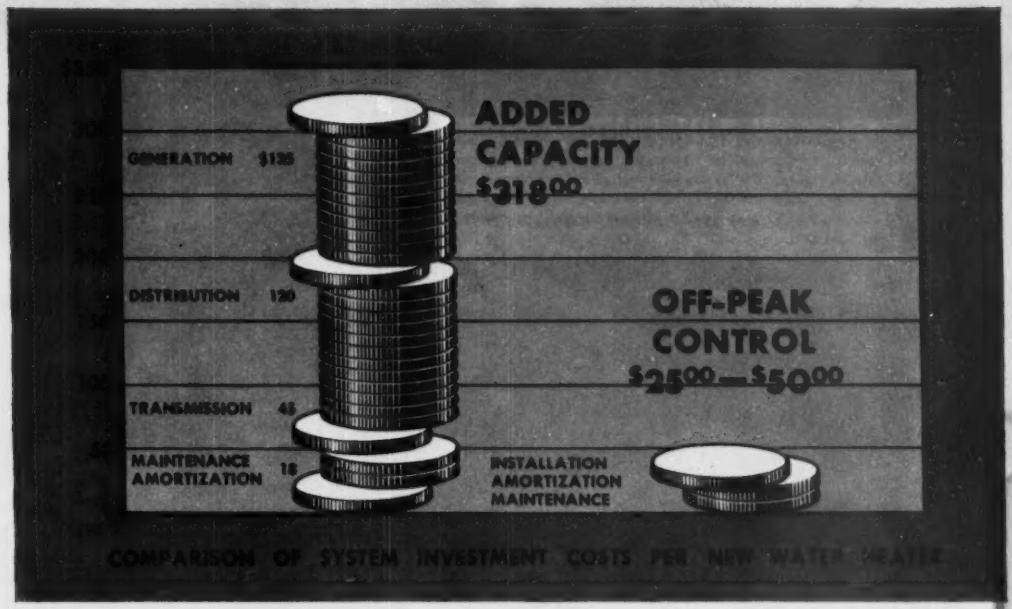
Watthour meters can be tested five at a time to within exceedingly close accuracy tolerances by one operator on a meter test board designed and built by the Niagara Mohawk Power Corporation. The board features five meter mountings which will accommodate any two- or three-wire single phase meter ranging from those built in 1914 to the present-day models, including socket types, and will easily handle 100 new meters per day.

Other features include facilities for selecting the proper current supply for 5- to 50-amp meters, a photoelectric revolutions counter initiated by push button control, and stroboscopic equipment for full load adjustment at unity and .5 power factor. Three additional test boards were built following satisfactory experience with the original model.

When A-base meters are to be tested, the meters are placed on contact pins located in the base of the meter mounting. The meter is locked in place by pneumatic arrangement at the top of the mounting, which also assures good contacts between the meter terminals and the contact pins. The mounting can be swiveled 90 degrees which permits access to the back of meters that are equipped with removable backplates. Mountings are insulated to permit a 2000-v dc insulation test which can be applied without removing the meters from the mounting. Socket meters are placed in the same mounting by use of a special adapter.

The potential circuit is simplified by the use of a multiple-winding potential transformer which provides an isolated source for each test position. A switch is arranged for the selection of any standard self-contained meter rating, either two- or three-wire. Another switch selects proper current to provide 10, 50 or 100 per cent loading at unity or 50 per cent power factor. A special relay initiated through a photoelectric revolutions counter transfers the current from an artificial circuit to the meter current coils just before start of a test run. This feature permits the rotating standard to operate continuously at a constant speed without causing meters under test to creep before the start of a test run.

The rotating standard is a special unit equipped with light source and mirrors which operate the revolutions counter through photoelectric cells. Stroboscopic facilities are also built into this standard which operates continually at 5 amp from the secondary of a multiple ratio current transformer.



Added Capacity or Off-peak Control... A Problem in Investment

Postwar electric water heater sales have averaged 800,000 units a year. Added capacity to handle these heaters would cost $254,400,000 per year—but is this an investment which *must* be made?

Today water heaters account for 13,500,000,000 KW hours annually—20 per cent of the total domestic load—yet only ten per cent of U. S. homes are currently using electric water heaters. By 1955 the total water heater load will be an estimated 23,100,000,000 KW hours.

INVESTMENT PROBLEM

How can expanding water-heating loads be added most economically to existing systems? The answer to this problem, where pronounced peak loads occur, can be found in today's improved methods of off-peak control of electric water heaters, either time switch or 720-cycle.

COST COMPARISONS

Industry figures for the last six years show that each kilowatt of installed capacity costs, on the average, $507.*

The diversified contribution of each water heater to the total load is approximately 0.6 KW. Each water heater therefore accounts for 0.6 x $507—or $300 of installed capacity. With maintenance and amortization included, the total cost of added capacity for one water heater is $318.

Where pronounced peak loads occur it is not necessary to install this new capacity. Off-peak control costs only $25 to $50 per installation, plus an average maintenance cost of one dollar per year.

ADDITIONAL SAVINGS

A controlled electric water-heating load increases considerably the load factor of a system. In addition, off-peak control can actually pay for itself annually.

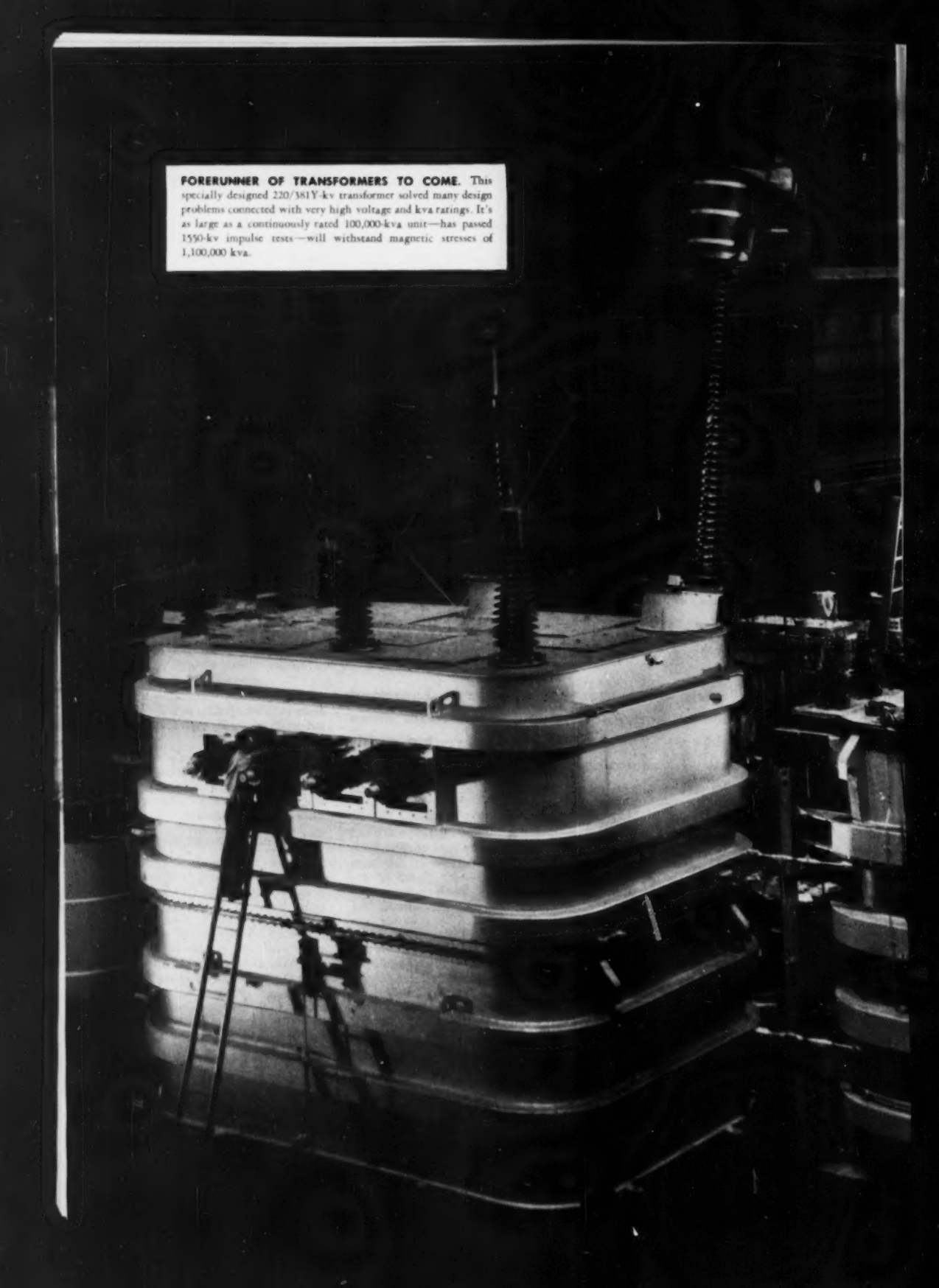
By solving the increasing water-heater load with off-peak control, many utilities are currently releasing much-needed capacity for the vital defense program.

SYSTEM STUDIES NEEDED

A thorough study of the economics of off-peak control is necessary if proper evaluation of individual requirements is to be made. Your General Electric Apparatus representative is prepared to discuss with you the possibilities which off-peak control may offer your own situation. For a more detailed report on the subject, write for GEA-5686: "Economics of Off-peak Control," *General Electric Company, Schenectady 5, N. Y.* 603-140

*Electrical World, Statistical Issue, Jan., 1952

GENERAL ELECTRIC



FORERUNNER OF TRANSFORMERS TO COME. This specially designed 220/381Y-kv transformer solved many design problems connected with very high voltage and kva ratings. It's as large as a continuously rated 100,000-kva unit—has passed 1550-kv impulse tests—will withstand magnetic stresses of 1,100,000 kva.

"CONCENTRIC LAYER" transformers withstand short-circuit forces of 1,100,000-kva duty

Units, impulse-tested at 1550 kv full wave, are installed in General Electric's new Switchgear Development Laboratory at Philadelphia.

Transformers for repeated short-circuit duty. Two 220,000/381,000Y—7750/15,500-volt transformers, connected to special short-circuit generators, supply the power that permits the new Switchgear Laboratory to simulate actual system faults. Each transformer can deliver 1,100,000 kva for a period of 10 cycles . . . and repeat this performance 15 times an hour.

"Concentric layer" winding solves short-circuit problems. The extremely severe duty requirements of these transformers were readily satisfied by the "concentric layer" winding. In this design, the conductor is wound in successive layers arranged concentrically and connected in series.

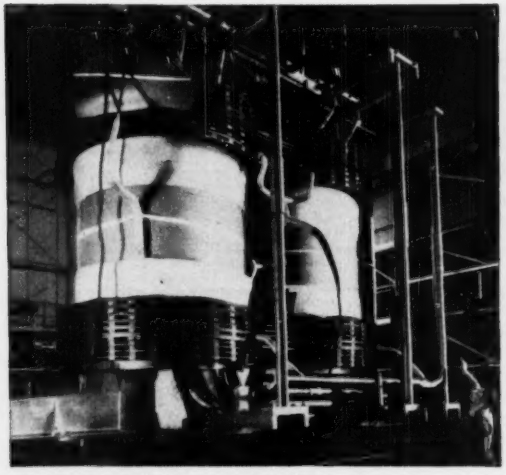
High short-circuit strength is inherent since major magnetic forces (as high as 2800 tons) are radial and well within both the tensile strength of the high-voltage conductors and the compressive strength of the cylinder on which the low-voltage coil is wound.

Impulse strength to withstand 1550-kv test was achieved readily with the "concentric layer" design. Voltage stress between layers is limited to the voltage of one layer since adjacent layers are connected in series.

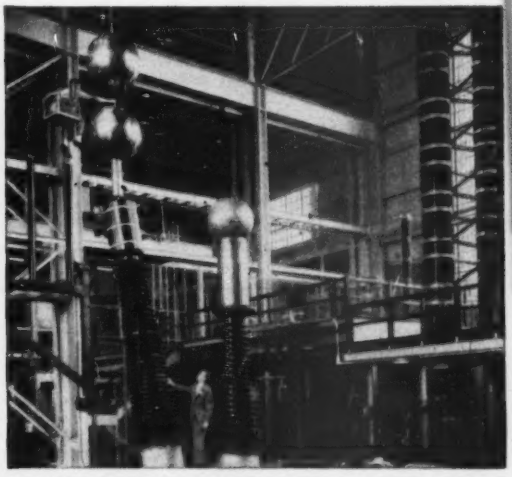
The cylinders of insulation between the layers are flanged over the ends of the winding to eliminate creepage in the direction of high electrical stress.

Uniform distribution of impulse voltages throughout the windings is assured by complete electrostatic shielding.

"Concentric layer" transformers for your system. These testing transformers, while designed to meet unusual requirements, demonstrate the excellence of "concentric layer" windings for high-kva, high-voltage service. If you are using or contemplating voltages 161 kv and above, you may wish more information on this design. Ask your local G-E apparatus sales representative for Bulletin GER-129, or write Section 401-31, *General Electric Co. Schenectady 5, New York.*



INHERENT SHORT-CIRCUIT STRENGTH of "concentric layer" design is even greater in these transformers because windings are tighter, more compact. Internal cooling ducts could be omitted since a continuous rating was not required for intermittent test operation.



282% OF RATED VOLTAGE. Test man sets 100 CM gaps for induced voltage test at 282% of rated voltage. Electrostatic shielding between all high-voltage-winding layers assures uniform impulse distribution in spite of the numerous tap leads brought outside the transformer.

GENERAL ELECTRIC

350 M cir mil Aluminum Conductor Deadends, Splices, Taps and Ties

Accompanying methods have been developed for making aluminum preformed partial or full deadends, preformed wire splices, aluminum-to-aluminum and aluminum-to-copper taps with tinned connectors, and insulator ties on 350 M cir mil weatherproof aluminum conductor lines. These methods are adapted from "Advance Information Sheets" of Detroit Edison Co

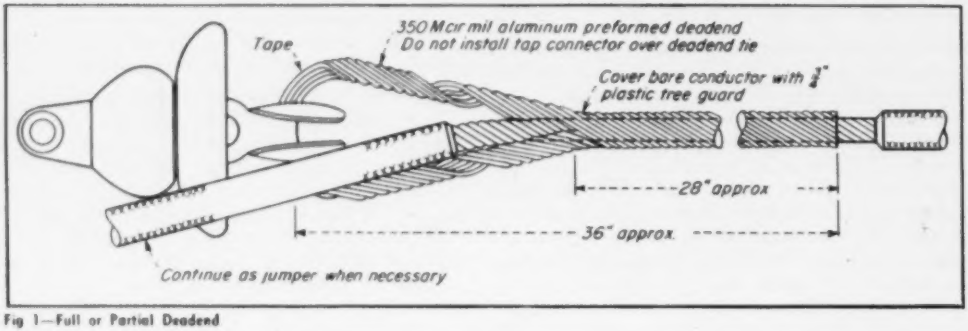

Tape
350 M cir mil aluminum preformed deadend
Do not install tap connector over deadend tie
Cover bare conductor with 3/4" plastic tree guard
28" approx
36" approx.
Continue as jumper when necessary

Fig 1—Full or Partial Deadend

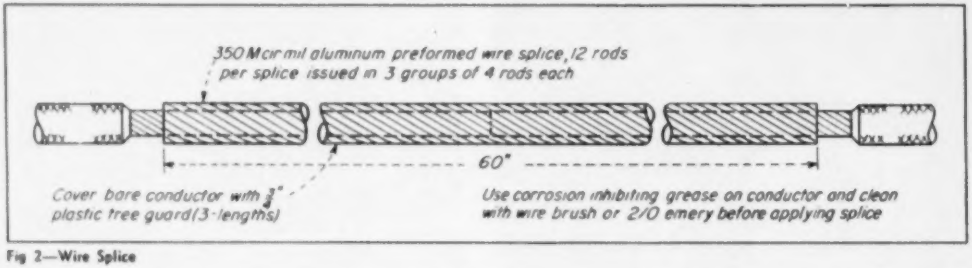

350 M cir mil aluminum preformed wire splice, 12 rods per splice issued in 3 groups of 4 rods each
60"
Cover bare conductor with 3/4" plastic tree guard (3-lengths)
Use corrosion inhibiting grease on conductor and clean with wire brush or 2/0 emery before applying splice

Fig 2—Wire Splice

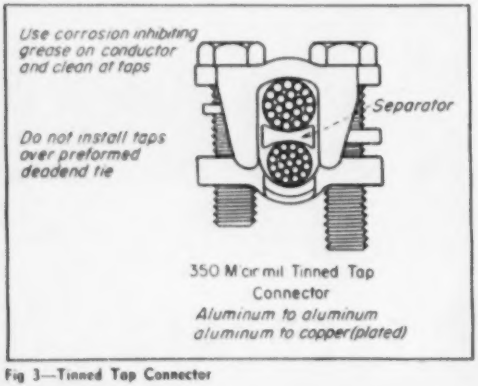

Use corrosion inhibiting grease on conductor and clean at taps
Separator
Do not install taps over preformed deadend tie
350 M cir mil Tinned Tap Connector
Aluminum to aluminum
aluminum to copper (plated)

Fig 3—Tinned Tap Connector

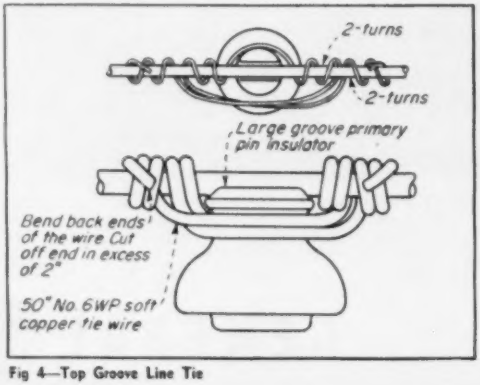
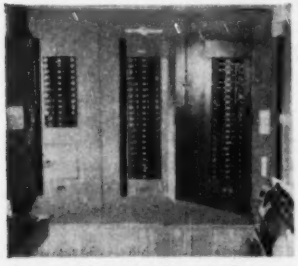

2-turns
2-turns
Large groove primary pin insulator
Bend back ends of the wire Cut off end in excess of 2"
50" No. 6WP soft copper tie wire

Fig 4—Top Groove Line Tie

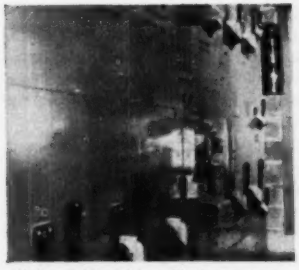
REVERE COPPER
IN TWO GREAT SEATTLE PROJECTS

Northgate Project, suburban shopping center, seen from the air

Air view of University of Washington's Health Sciences Building



Switch and fuse type lighting panelboard for control and protection of lighting circuits in another Northgate store



Main switchboard in a Northgate store

Large electrical loads are required to serve these two Seattle projects. To carry heavy currents safely and with minimum voltage loss, prefabricated Flex-A-Power distribution systems, with copper bus bars made by Revere, were installed, plus protective circuit breaker switchboards, control centers and lighting panelboards. Revere Copper, Brass and Bronze are used in these products. Flexible distribution systems and protective control equipment were furnished by Trumbull Electric, Department of General Electric Company, Plainville, Connecticut, and Seattle, Washington.

The two projects consist of the University of Washington's Health Sciences Building, dedicated in 1949, housing the schools of medicine, dentistry, and nursing; and the Northgate Project, world's largest shopping center, containing 78 stores plus 50 medical offices, a hospital, a theater, covering 26 city blocks. In the generation and use of electricity copper is preferred, because it has the highest electrical conductivity of all the commercial metals. Revere is proud to have supplied copper for these two large projects, and to many others the country over.

REVERE

COPPER AND BRASS INCORPORATED

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• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities. Distributors Everywhere.

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

Electrical distribution runs fan out from four dead-front, self-contained load centers located in Health Sciences Building basement

Four-wire, 2000 amp Trumbull Flex-A-Power system distributes power throughout new Health Sciences Building

FULL-SWIVELING CARRIAGES on two truck tractors enabled Washington Water Power contractor to transport long poles into almost inaccessible mountainous country through the dead of winter for construction of 115-kv, H-frame line from the new Cabinet Gorge plant

Tandem Tractors Tote Tall Timbers

To haul long poles over winding mountain roads, a contractor for Washington Water Power Company used two truck tractors with full-swiveling carriages above the drivers' heads. The poles were used in a mountainous section of the 115-kv, H-frame line being built from WWP's Cabinet Gorge plant in northern Idaho to Spokane, where steering trailers could not be used.

The contractor used two standard truck tractors, without body, cab, or even windshield. The swiveling carriages were mounted on a metal framework directly behind the driver. To load, the tractors were spaced the length of the poles apart, and a small mobile crane lifted the poles up onto the carriages, one at a time. After the poles were chained next to each other on the carriages, shorter poles were chained on top of them.

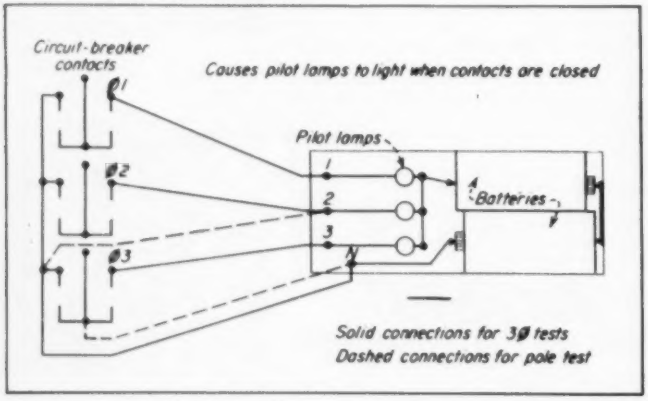
Drivers of the tractors operated according to a prearranged set of signals for starting, stopping, and shifting gears. They drove in tandem in all but the sections of road with sharp switchbacks. Switchbacks were lengthened by bull-dozers to the full length of the poles where necessary, so the rear tractor could clear the bend. Then both tractors turned 180 deg beneath the poles and started back on the other leg carrying the poles in the opposite direction.

The mobile truck-mounted loading crane accompanied the hauling rig to unload the poles where they were being delivered.

Indicator Checks Simultaneous Operation of OCB Contacts

A. L. HELDRETH, Substation Foreman, Appalachian Electric Power Co, Charleston, West Virginia

A simple, pocket-size indicator has been built for testing only the simultaneous engagement and separation of contacts in oil circuit breakers. Tests are performed by operating the breakers manually after opening disconnect switches.


Circuit-breaker contacts
Causes pilot lamps to light when contacts are closed
Pilot lamps
Batteries
Solid connections for 3Ø tests
Dashed connections for pole test

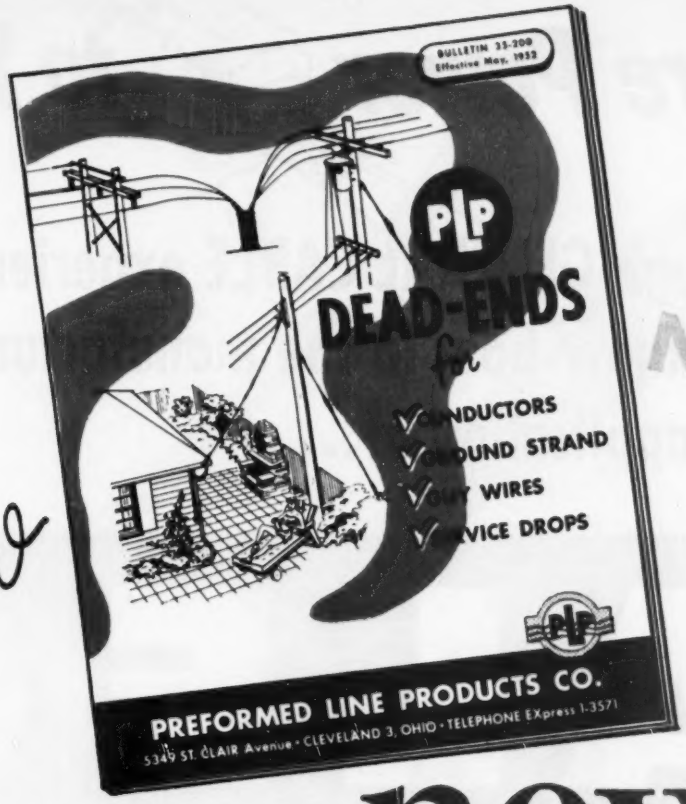
CONTACT ALIGNMENT TESTER causes pilot lamps to light when breaker contacts are closed. Dashed lines are connections for testing simultaneous engagement and separation of each pair of contacts. Solid lines are connections for testing 3-phase (3-pole) breakers

This device is for this one specific test and does not replace instructions by manufacturer or equipment for testing contact travel speed, interval between opening and reclosing of contacts, simultaneous engagement or separation under automatic operation.

The tester shown in the diagram has been used advantageously for more than 2 years. It utilizes 2.5-v flashlight bulbs, mounted in radio pilot-light sockets and 1.5-v flashlight batteries. All are mounted in 3 x 3 x 9-in. case made of plywood, and connected with four terminal clips. Three small holes in top of case expose tip ends of pilot lamps.

To test simultaneous opening and closing of each pair of contacts, connections are made to the breaker terminal and crosshead, as shown in the diagram by dashed lines. To test simultaneous engagement and separation of all phase contacts, connections are made only to the breaker terminals, as shown by solid lines.

(*Continued on page* 160)



new

NEW

new...

ask for your Copy

This new Bulletin not only tells why Preformed Dead-Ends are more efficient and more economical, but also details how they develop the full strength of all grades of strand and conductor *without* any concentrated pressures that could cause conductor deformation . . . of particular importance with all-aluminum conductors.

PLP

PREFORMED LINE PRODUCTS CO.

5349 ST. CLAIR AVENUE
CLEVELAND 3, OHIO

Preformed Line Products Company
5349-A St. Clair Ave., Cleveland 3, Ohio.

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and application of...

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PIONEERS IN ALU

TRAL

ALUMINUM

WIRES and CABLES

Twenty years ago, ALECTRAL pioneered the use of aluminum as a conductor for all purposes. The name was assigned to wires and cables of high tensile strength *aluminum*, engineered as solid or stranded conductors for transmission and distribution service.

Today General Cable can supply all types of ALECTRAL, including ALECTRAL-ACSR (bare and weatherproof), ALECTRAL Weatherproof ("O.K.", "Peerless", "Tip-Top" and Polyethylene covered) and ALECTRAL Insulated Service Drop and Entrance Cables.

General Cable manufacturing and field experience with aluminum conductors well qualifies our engineers to offer intelligent and practical counsel to the many who are planning to use aluminum conductor cables on current or future projects.

GENERAL CABLE
CORPORATION

EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

"ALECTRAL", "O.K." "PEERLESS" AND "TIP-TOP" ARE REGISTERED TRADE MARKS OF GENERAL CABLE CORPORATION

MINUM WIRE AND CABLE

OCB Checking

(*Continued from page* 156)

Simultaneous lighting of the flashlight bulbs will show simultaneous closure of contacts; simultaneous extinguishment will indicate simultaneous opening of contacts. The lag between contact closure and lamp brilliance or between contact separation and lamp darkening does not impair the accuracy of the test appreciably for several reasons: (1) Flashlight bulbs respond faster than 115-v, 50-w lamps having filament with higher heat-storage capacity; (2) the contacts can be opened and closed slowly with manual operation; (3) relative operations only are sufficient and these are indicated if the lamps are similar.

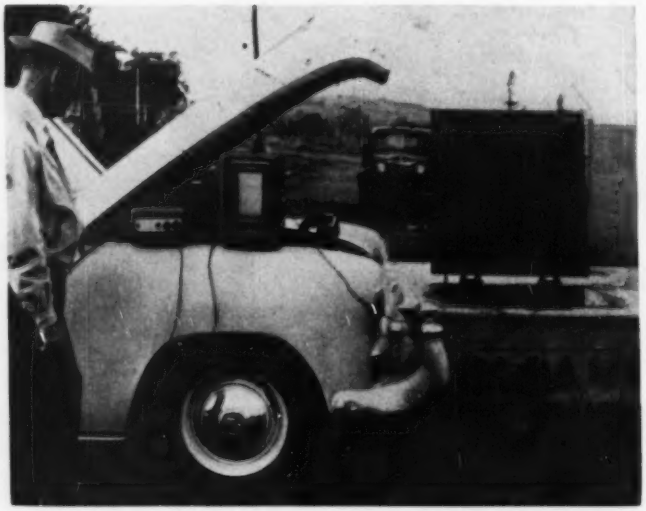
If lighting or darkening of the pilot lamps is not simultaneous on each single pole test, the breaker contacts must be adjusted until the contacts close and open simultaneously, before testing all phase contacts. If the combination does not close and open simultaneously, the lift rods must be adjusted until the pilot lights act in unison.

Photoelectric Recorder Locates Pipe Corrosion

Locating corrosion in water pipe lines of the East Bay Municipal Utility District in California has been simplified through the use of a General Electric photoelectric recorder. This same method could be applied to gas lines or underground conduit runs.

District engineers recently used the recorder to make electrolysis surveys of a 94-mi. stretch of water pipe. The instrument's portability simplified matters by letting it be set up in automobiles during the test runs.

Each section surveyed was from 1500 to 3000 ft long and contained concrete structures with manholes through which wires from the recorder were attached to the pipe. Whenever a drop in current was noted, corrosion was indicated and steps to remedy the situation were started. The engineers performing the tests said the photoelectric recorder offered many advantages over the potentiometer-type indicating instrument.



PHOTOELECTRIC RECORDER simplifies locating corrosion on underground pipe systems. As seen in picture, the recorder was set in automobiles of engineers conducting survey

Reclamation Saves 98% of Used Connectors

FRED C. HESS, Distribution Retirement Supervisor, Indiana & Michigan Electric Co, South Bend, Indiana

As much as 98% of our used solderless connectors have been salvaged by a three-step chemical treatment involving a stripper, scale remover, and finish. The reclamation material cost was repaid in one day's operation.

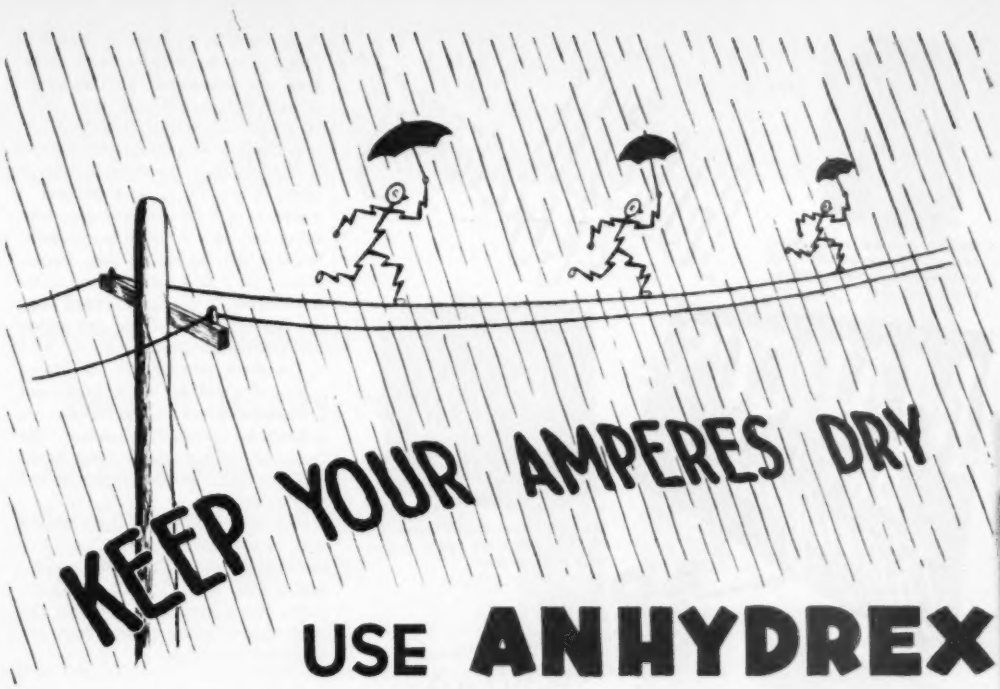
By this new method 2,000 solderless connectors were treated in one day and only about 2% remained unusable. Also the treated items had a new appearance which tends to make users handle them like new equipment. By the former method of reclamation (soaking and stirring in kerosene) as many as 50% of the items were rejected.

Other line materials satisfactorily treated are hot-line clamps, bolts, racks and terminals. Porcelain items covered with paint are cleaned readily by using only the stripper. After removal from the chemical, porcelain is rinsed, dried and then wiped dry with a cloth.

Complete metal reclamation process involves three steps and solutions:

1. Stripper. To remove paint, grease or oil, an alkaline stripping solution is used. Six ounces of the powder are added to each gallon of water in a metal container and heated between 180 and 212 F. Items to be reclaimed are placed in a wire or perforated-metal basket and submerged in the hot solution for about 20 min, or until clean. Next, the basket with its contents is removed and rinsed in clear water. This cleaning solution can be re-used until too much sludge accumulates in bottom of container. About 2 gal of solution should be prepared at one time.

2. Scale Remover. To remove scale and corrosion an acid solution is placed in a 5-gal glazed pottery container. The acid, which comes in 1-gal jugs, is mixed half and half with water and used at room temperature.



KEEP YOUR AMPERES DRY

USE ANHYDREX

Water in some form or other causes more interference with satisfactory cable service than any other one thing. Even small amounts of moisture finding their way into cables can put important power circuits out of business.

Cables in ducts are nearly always exposed to water. Even aerial cables can suffer from water. That is why you should use ANHYDREX cables to keep your amperes dry. With Simplex Anhydrex rubber insulation you need not use a lead sheath. ANHYDREX cables will function satisfactorily even under the wettest conditions.

You can avoid cable troubles on your important network and feeder circuits by using Simplex Anhydrex insulation on your cables. In that way you assure yourself that your amperes will always be dry. If you would like to know more about this dependable, long-lived insulation, simply send a request to the address below.

SIMPLEX ANHYDREX

SIMPLEX WIRE & CABLE CO. 79 SIDNEY ST. CAMBRIDGE 39 MASS

TYPE C

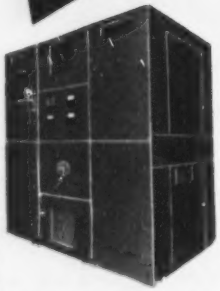
General purpose transformers, 600 volts and below; 1-15 KVA inclusive, single or three phase

HIGH efficiency

MARCUS DRY TYPE transformers

450 KVA, Type F Unit Substation, 4160 V. Delta, 60 Cycles, 3 Ø—120/208Y, 4 wire.

LOW maintenance



1500 KVA, Type F Unit Substation, 4800 V Delta 60 Cy, 3 Ø—120/208Y, 4 wire.

Years of specialization in the dry type transformer field have resulted in a far superior product. Being ahead of the rest of the field is the natural result of continuous effort and research in uncovering new materials which are your constant assurance of maximum transformer value.

MARCUS DRY TYPE, AIR-COOLED TRANSFORMERS

ARE SAFE — No explosion or fire hazards. No fire proof vaults. Class B and C heat proof insulations.

ARE ECONOMICAL — Lower cost installation and operation, negligible maintenance.

For the transformer that's second to none, specify MARCUS.

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY

1 to 2,000 KVA up to 15,000 Volts to meet Individual Requirements

- DISTRIBUTION
- GENERAL PURPOSE
- UNIT SUBSTATION
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

NEMA

Representatives in Principal Cities

MARCUS TRANSFORMERS CONFORM TO THE STANDARDS OF N.E.M.A. AND A.I.E.E.

MTC

MARCUS TRANSFORMER CO. INC.

30 MONTGOMERY STREET

HILLSIDE 5, NEW JERSEY

PIONEERS IN THE FIELD OF AIR COOLED TRANSFORMERS

After items in wire basket have been removed from "Stripper" and rinsed, they are submerged in "Scale Remover" for 4 or 5 min after which they again are rinsed in clear water.

3. Finish. To give new-finish luster to cleaned brass, bronze or copper items, 2 gal of an acid solution is placed in a 5-gal glazed-pottery container and used at room temperature. Items in wire basket are flash dipped, usually for 2 to 5 sec, but the process is repeated if necessary. Then they are rinsed in clear water, and spread on cardboard to dry.

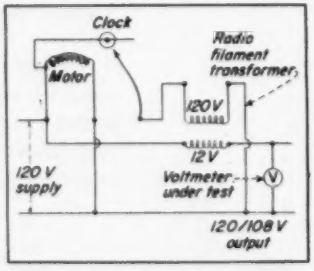
The three solutions do not evaporate readily and can be left in covered containers between times of use. A precaution—obviously chemicals like these, powerful enough to clean metal, should not be allowed to contact the skin or eyes.

The chemicals for a year's supply cost approximately $30. Containers and electric hot plate cost approximately $40. Entire cost of equipment and a year's supply of chemicals are more than regained in one day's reclamation operation.

Recording Voltmeter Checking Device

L. C. ENGLISH, District Meter Supt, Virginia Electric & Power Co, Alexandria, Va.

To further check the accuracy of recording voltmeters, the Virginia Electric and Power Co has constructed an automatic means of acquiring a variable voltage. This equipment saves



RECORDING VOLTMETER accuracy is further checked by inexpensive equipment connected as shown in the diagram

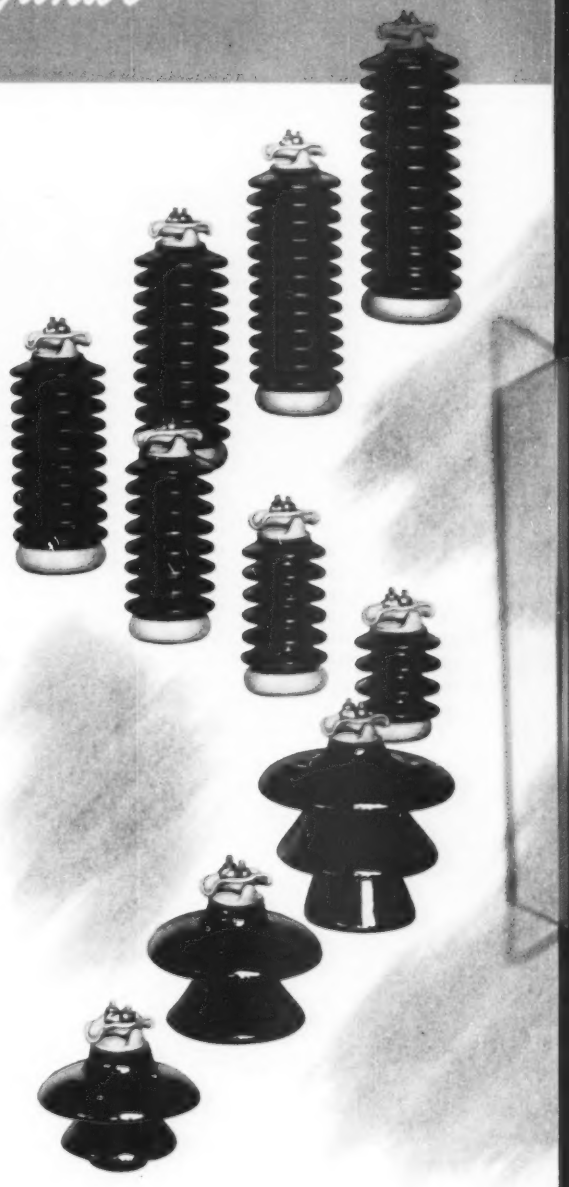
considerable time in checking instruments to determine whether they respond to a change in voltage. Because of friction and dirt, meters sometimes draw a straight line or make the

(*Continued on page* 167)

HI-TENSION NEWS *Junior*

Now...There's an O-B Clamptop

- **For Any Voltage 22 to 69 KV**
- **For Conductor ¼ Inch to 1½ Inch**
- **For Pintype or Line Post**



Now you can have the modern successor to the tie wire - - the O-B Clamptop - - for any voltage from 22 to 69 kv, and any size conductor cable from ¼ inch to 1½ inch, either in the conventional pintype design or the line post. Voltage, conductor diameter, or insulator style, are all now fully accommodated in the Clamptop category.

With Clamptops, loose connections at the insulator head, slipping conductors and strand chafing are ended. A man without special skill, using a common hand wrench, can make up the "tie" in considerably less than a minute, and make it better, stronger, and more lasting than the best-installed long-wire hand tie. If lines must be worked with hot tools, the Clamptop is outstanding in its simplicity, speed of handling, and much greater safety.

If you feel that the established pintype insulator design - - regular or post - - can't be improved upon, you haven't investigated the Clamptop. It's simple to handle, saves valuable time, and produces a better job at each point of support - - and it is now available for free choice in the complete 22-69-kv range. By substituting a secure clamped connection for an insecure tie wire, you gain a long list of practical advantages. Specify O-B Clamptops on your next line project and see for yourself.

Ohio Brass

MANSFIELD, OHIO, U. S. A.

HI-TENSION NEWS *Junior*

When You Figure Years Per Dollar

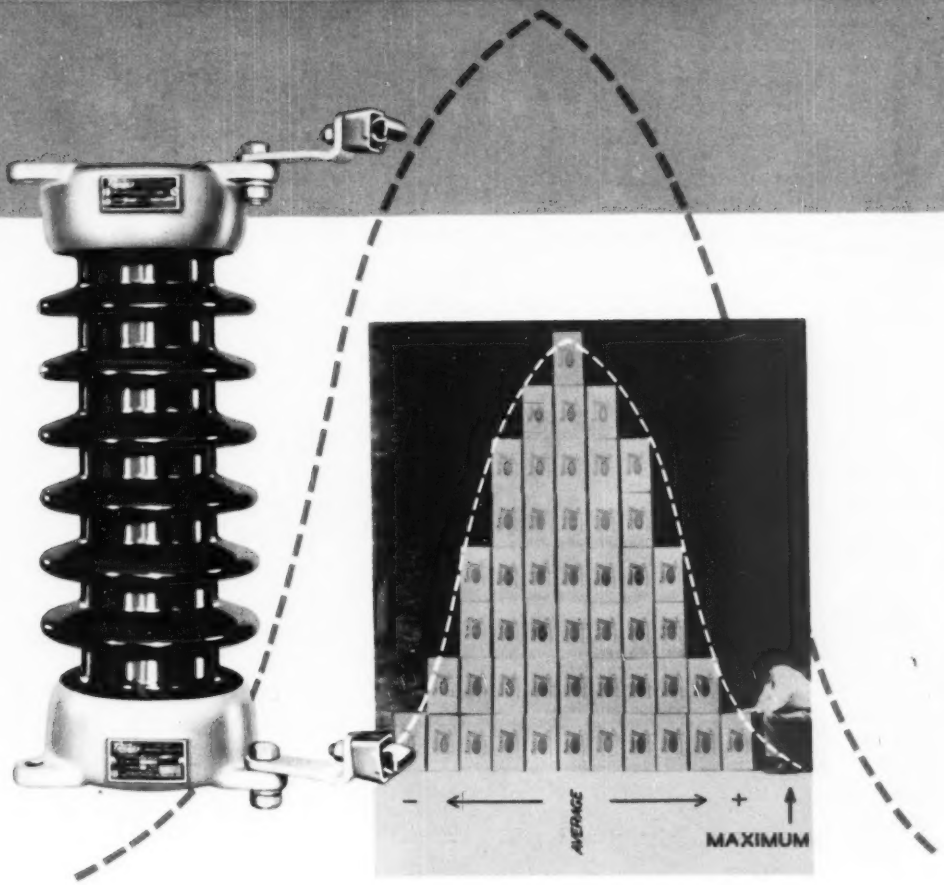
. . . here's a real bargain!

● If you ask, "Will this station insulator fit my system standards?", the answer is easily found, as the industry closely defines measurable factors.

If, however, you were to ask, "How long will this station insulator give satisfactory service?", there is no simple answer - - at least not until those years have passed.

Be sure to distinguish between what *can* and what *can't* be measured when you buy station insulators. Likewise be sure to recognize that *time* actually determines your real money's worth. And, years of performance can't be covered in a specification.

Most O-B station insulators are bought on repeat order, today, by men who have *had* their chance to gauge their money's worth. For a genuine bargain, figured in years per dollar, equip your stations with O-B.



MAXIMUM VALUES

. . . . An Arrester Rating You Can Trust!

Assume a large group of lightning arresters that have passed factory inspection and are ready for shipment. Possibly one *just passed* - - that would be normal expectation - - and all the rest are better. But, you use these arresters one-at-a-time. Is the one you are looking at the poorest, the best, or the average of the group? It would be well to know this, especially if the spread of performance is wide, before trusting it to protect a valuable transformer.

You have no answer to the question if your arrester is rated in terms of average performance. Average values don't imply that you will get an average specimen - - in fact they admit considerable departure from what you *think* you may have.

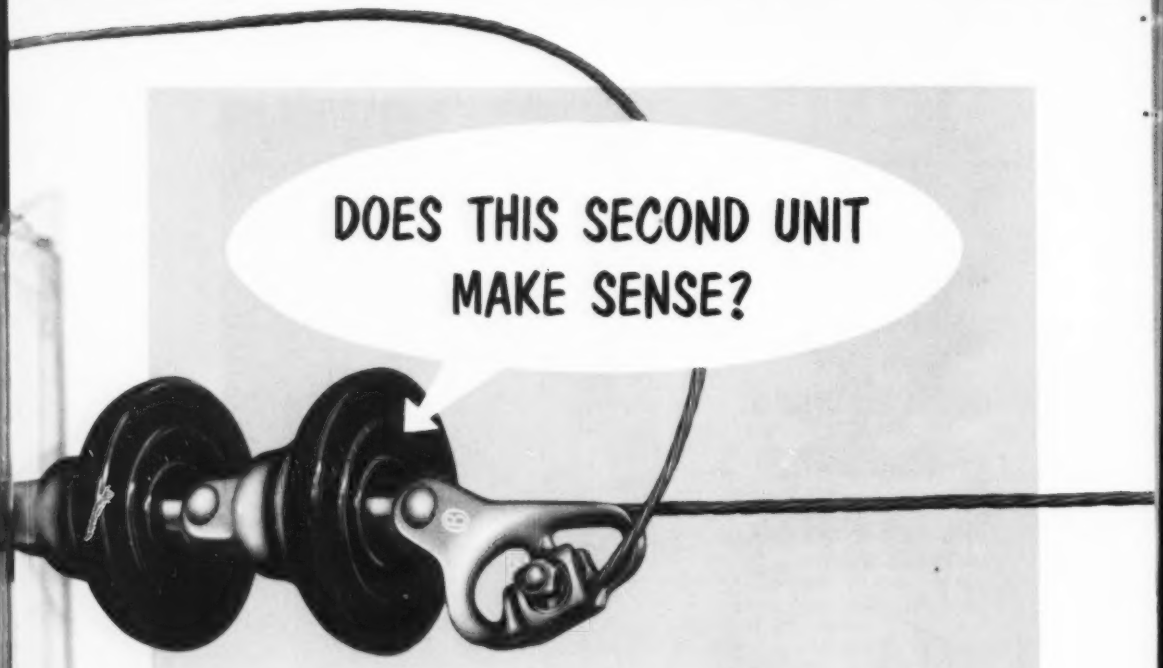
When you buy an O-B Thorex arrester, however, its rating is realistic - - in fact it is pessimistic! We rate *just one* unit. This is the poorest that will pass inspection. O-B arrester ratings state MAXIMUM values, not average. Every single Thorex arrester is as good or better than listed. Obviously, practically all are better. And even the MAXIMUM Thorex arrester is the biggest dollar's worth of protection that you can get.

When you put a lightning arrester to work, *know* what it will do. This means buying an O-B Thorex - - the only arrester sold under MAXIMUM ratings.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*



DOES THIS SECOND UNIT MAKE SENSE?

Let's say you build a primary distribution deadend at 4,000 volts, figuring at least 15 years' life, and using a single 6-inch suspension unit. Urban residential power consumption has increased $3\frac{1}{2}$ times in only 13 years, and the rate of increase is quickening. Will 4,000 volts do the job, not in fifteen years, but perhaps five years? If voltage goes up, a second insulator unit must be added to the deadend. Is it wise to build that deadend twice when once would have finished the job?

What does it cost in time to rebuild this deadend, probably hot? What is involved in getting rid of an extra five inches of sag imposed by the second unit? Will these costs look good compared to a couple of extra dollars spent originally? That's all we're talking about.

In other words—at the time of original construction does this second insulator unit make sense?

Ohio Brass

MANSFIELD, OHIO, U.S.A.

4229-H

Voltmeter Checking

(*Continued from page* 162)

voltage regulation look better than it actually is.

The equipment used for making up the checking device consists of a time switch and a 120/12-v transformer. The 1-rpm motor of the time switch was replaced with one running 60 rpm, and the trip levers on the clock dial were arranged to give twenty minutes on followed by twenty minutes off.

The secondary of the transformer is connected in series with the voltmeters under test to buck the applied voltage; the primary winding is connected across the line through the contacts of the time switch. With a supply of 120 v, the meter under test would receive 108 or 120 v, a difference of 12 v.

Inventory Board Counts Transformers

R. D. ALEXANDER, Electric Maintenance, San Diego Gas and Electric Co, San Diego, Cal.

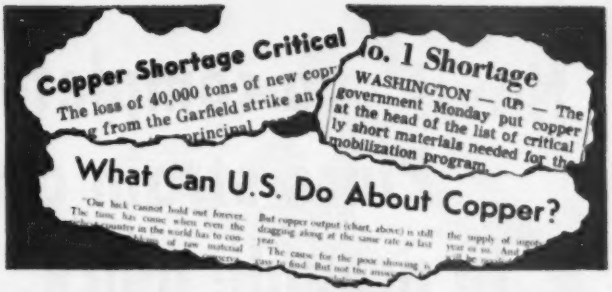
Running physical inventory of distribution transformers returned for repairs, repaired, and tested and ready for use is a simple matter with the aid of a transformer inventory board developed by San Diego Gas and Electric's electric shop. The board provides an accurate count of 24 types of single and three-phase transformers from ratings of 3 to 200 kva and 4 kv on up.

The board is made from ordinary ⅜-in. plywood ruled off vertically and horizontally in one-inch columns. Transformer types, including all the common voltage ratios and winding arrangements, are identified across the top by code letters. Size is indicated down the left side. Each rating has three vertical columns — indicating transformers that are 1) to be repaired; 2) being repaired or tested; and 3) ready for use.

Small hooks in each of the squares carry round tags representing the number of transformers of that size and voltage rating—yellow tags one transformer, green five, and red ten.

For the two or three most common ratings, of which three or four hundred may be in the yard at one time, the hook carries a white tag with the

(*Continued on page* 170)


Copper Shortage Critical
The loss of 40,000 tons of new copp
g from the Garfield strike an
principal
o. 1 Shortage
WASHINGTON — (UP) — The government Monday put copper at the head of the list of critical ly short materials needed for the mobilization program.
What Can U.S. Do About Copper?
"Our luck cannot hold out forever.
The time has come when even the
of raw material
But copper output (chart, above) is still dragging along at the same rate as last year.
The cause for the poor showing
the supply of copp
year as we. And

S-T-R-E-T-C-H Allocations of Critical Materials • Cut Your Labor Costs

Stock sizes: 50 V.A. to 15,000 V.A. 460/230 Volt Pri. — 230/115 Volt. Sec. 575 Volt Pri. — 230/115 Volt Sec.

Increase power capacity for expanded production in your present plant or effect maximum economies in material and labor costs in wiring the new plant. Distribute only high voltage (460-575). Step down voltage (230-115) at point of use with Jefferson air-cooled Power Circuit Transformers.

High voltage power distribution provides greater voltampere capacity with no increase in copper wire and steel conduit sizes. You stretch your copper and steel allocations, save wiring costs, maintenance costs, and installation time.

Long life, economical Jefferson Power Circuit Transformers can be mounted directly on, or adjacent to, machinery or point where low voltage is required. No special vaults are required. Ample wiring compartments and both 1/2" and 3/4" knockouts are provided for rigid or flexible conduit connections.

Investigate now. See how you can modernize power distribution and stretch critical material allocations by installing Jefferson Power Circuit Transformers. Write for Bulletin 501-15.

JEFFERSON ELECTRIC COMPANY
Bellwood, Illinois

JEFFERSON ELECTRIC

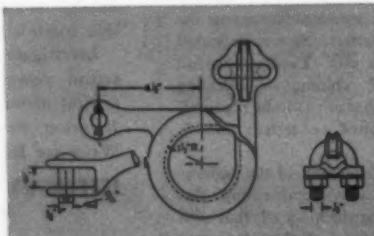
JEFFERSON TRANSFORMERS

Now!...a complete line of Pinco strain clamps to provide quick, easy and positive clamping of aluminum conductor in distribution line construction

Clamping Aluminum Conductor presents no problem when you use Pinco Strain Clamps, for they incorporate all of the features which provide for quick, easy installation at low cost. Although these Clamps were designed primarily for Aluminum Conductor on distribution lines, they are equally well adapted for use with other types of conductor in their cable seat range.

Anticipating the trend toward the growing acceptance and use of Aluminum Conductor, Pinco Engineers were charged with the responsibility of designing Strain Clamps to accommodate this new type of conductor . . . the *first* to be offered to the industry. Such action is indicative of Pinco's forward looking policy of designing its products to meet both present and future industry requirements . . . proof too that Pinco planning, like Pinco products, is always "RIGHT ON THE JOB." Remember this whenever *you* specify and purchase Insulators and Line Hardware.

All of these clamps are available for prompt shipment. We suggest you order them on the same requisition with your Pinco 1510 Insulators (the 6" disc that is built like a transmission insulator).



PINCO L 1921

Cable seat range .16" to .55" for ACSR No. 4 to No. 1/0 inclusive; also for all other conductors in its cable seat range.

TYPES AVAILABLE FOR CLAMPING ALL SIZES OF EITHER ALL-ALUMINUM OR ACSR CONDUCTOR

Linemen Like to Work with Pinco Strain Clamps—

HERE'S WHY...

- Easy to blanket when working lines "hot." Entire clamp is confined to an area 7 inches square.
- Excellent snubbing action, making them "easy" on the conductor.
- Gentle "wave form" seat provides maximum conductor grip.
- "Come-along" attachment is provided in all five clamps for easy installation of conductor.
- Quadrant type design of 4550, 4468 and 4485 allows continuous "running" of conductor—eliminates necessity of cutting the conductor at strain points to make "jumper" loops. The same applies to snail shell design of 1921 and 4536 clamps.
- Quadrant type clamps Nos. 4550, 4468 and 4485 can be supplied with aluminum liners.
- Constructed of highest quality malleable iron and forged steel properly treated then hot-dip galvanized. Have Steel U-Bolts and Cotter Bolts, hot-dip galvanized, Spring Brass Cotter Keys.

The Porcelain Insulator Corporation
LIMA, NEW YORK

Sales Agents: **JOSLYN MFG. & SUPPLY CO.**
Offices in Principal Cities

PINCO INSULATORS
RIGHT ON THE JOB

DON'T GAMBLE!

- ✔ Improved thermal endurance
- ✔ High dielectric strength
- ✔ Excellent thermal conductivity
- ✔ Top tensile strength
- ✔ Rot repellent
- ✔ Resists chemicals and acids
- ✔ Good moisture resistance

GLASS VAR is available in rolls, sheets and tape.

ELECTRO

TECHNICAL PRODUCTS

You will find these other Class "B" Electro products tops in quality and performance

VARNISHED ASBESTOS CLOTH
VARNISHED QUINORGO ASBESTOS PAPER
QUIN-GLASS HI-TEMPERATURE INSULATION

Electrical equipment manufacturers are invited to use our Special Service facilities. Write or phone and we'll be glad to help you with your problem and send you technical data, samples, etc.

You may buy with confidence when you buy

ELECTRO-TECHNICAL PRODUCTS

DIVISION OF SUN CHEMICAL CORPORATION

NUTLEY 10, NEW JERSEY

*T. M. Reg. U. S. Pat. Off. by Owens Corning Fiberglas Corp.

Inventory Board

(*Continued from page* 167)

proper multiple of one hundred written on it to keep the number of tags on one hook within a reasonable number. For example, if 447 transformers of one rating are in the yard ready for use, the hook will carry a white tag with "400" written on it, four red, one green and two white tags.

Use over the past eighteen months has shown the board to be accurate and a big help in maintaining close control over operations of the repair shop. It has also served as an excellent means of watching transformer stocks for impending shortages of particular ratings so they can be ordered well in advance of need.

Silicone Grease For Contact Surfaces

LLOYD K. YERGER, General Foreman, Niagara Mohawk Power Corp, Buffalo, N. Y.

Use of a silicone grease on certain types of contact surfaces is providing Niagara Mohawk Power Corp with these operating benefits:

1. Improved conductivity by reduction of oxidation
2. Protection against moisture if not exposed to weather
3. Can be applied and handled in warm or cold weather. The grease does not "run-out" in hot weather.

The grease is used to moisture-proof transmission line splices. It is applied to blades of disconnect switches and contacts on socket-base meters to prevent oxidation. In standard, rubber-insulated, high voltage cable it is used to obtain a moisture barrier. The silicone compound does not provide a conducting path when it decomposes at about 350 F, but forms silicon dioxide.

The silicone grease is non-toxic and does not affect rubber, bakelite or vinyl materials. It has the characteristics of a leather preservative, and for this reason it is used to extend the life of linemens' belts. Because heat or high pressure tend to decompose the grease, it should not be used as a lubricant.

This silicone grease, called DC-4, was obtained by Niagara Mohawk from Dow Corning Corp., Midland, Mich.

Free Booklets

tell all about aluminum wire

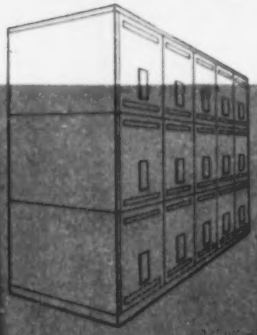
Get the full facts about United States Rubber Company's Aluminum Wires and Cables. These two clearly written, informative booklets are packed with data on specifications, standards, photographs showing stripping, joining, soldering—installation facts of all kinds, plus property tables. In addition, there is a table showing how "U. S." Aluminum wire's insulation properties compare with Underwriters' Laboratory Standards.

These booklets are FREE. Send for your copies today!

United States Rubber Company

Electrical Wire and Cable Department
1230 Avenue of the Americas
ROCKEFELLER CENTER • NEW YORK 20, N. Y.

To simplify switchgear problems...plan your

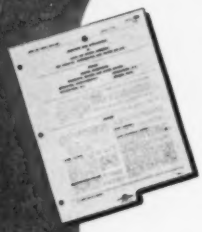


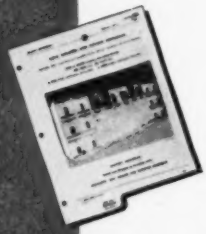
***BEFORE YOU SPECIFY*—SEND FOR YOUR FREE COPIES OF THIS INFORMATIVE I-T-E LITERATURE**

I-T-E Selection and Application Data is specially prepared by I-T-E application engineers to help you through the important steps in planning your switchgear system.

CATALOG SECTION 1003—Comprehensive, illustrated 50-page catalog contains complete data on selection and application of I-T-E low-voltage air circuit breakers and individually enclosed circuit breakers (Urelites).

CATALOG SECTIONS 1104, 1304, 1404, 1504—Detailed description of construction, operation, and application of I-T-E's KA, KB, KC, and LG circuit breakers—and I-T-E's full line of auxiliary and trip devices. Catalogs give you useful tables, wiring diagrams, mounting instructions, and dimensions.





CATALOG SECTION 6004—gives full information on I-T-E Multumite metal-enclosed, low-voltage switchgear. Completely describes I-T-E drawout construction and cubicle design. Contains useful specifications, dimensions, and suggestions for planning your metal enclosures.

FREE

I-T-E CIRCUIT BREAKER CO.
Switchgear Division, Dept. EW
19th and Hamilton Sts.
Philadelphia 30, Pa.

Please send me the catalogs which I have checked:

- ☐ Catalog Section 1003
- ☐ Catalog Sections 1104, 1304, 1404, 1504
- ☐ Catalog Section 6004

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

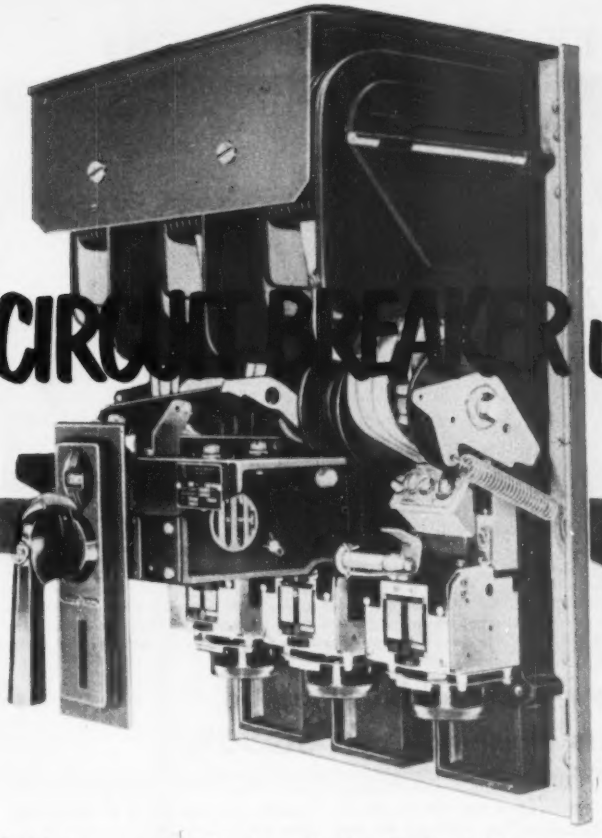
I-T-E

LOW-

I-T-E CIRCUIT

Canadian Mfg. & Sales:

layout from CIRCUIT BREAKER up



I-T-E CAN SUPPLY INDOOR AND OUTDOOR EQUIPMENT IN RATINGS:

15,000 to 100,000 amperes interrupting
600 volts a-c, 250 volts d-c
to 6,000 amperes continuous, a-c or d-c
to 10,000 amperes continuous, d-c only

Expansion or modernization of your electrical distribution system calls for detailed analysis. Before you can properly select your system and equipment, you must consider such important factors as load, power supply, circuits, *protection*, and *reliability*.

This means getting down to fundamentals. And, fundamentally, system reliability depends on *circuit breaker* protection. That's why it pays to think of your switchgear requirements *first of all* as circuit breaker applications.

Follow these three simple steps when planning your switchgear layout. You can then be sure that the circuit breakers you buy will provide the protection you need:

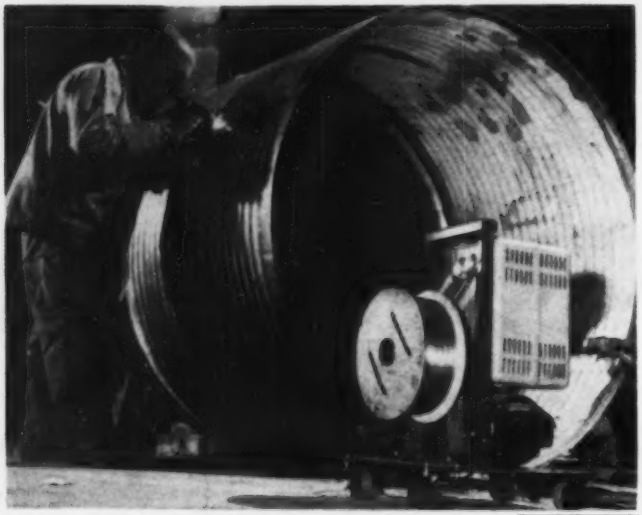
- **KNOW YOUR APPLICATIONS**—their load characteristics, protection requirements, need for continuity of service;
- **KNOW THE CIRCUIT BREAKER** features and functions that will satisfy all application requirements;
- **KNOW THE MANUFACTURER**—his ability to help you solve your problems and provide the best breakers for the job.

I-T-E experience and specialists are at your service. Your local I-T-E application engineer will gladly work with you on any switchgear problems. Get to know him. Give him a call—*today*.

VOLTAGE SWITCHGEAR

BREAKER COMPANY • 19TH AND HAMILTON STS. • PHILADELPHIA 30, PA.

Eastern Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., N. Y. 17, N. Y.



General Electric Co

PROCESSING VAT LINING being arc welded by new hand equipment which provides automatic flow of filler metal enabling operator to speed up inert arc welding where filler metal must be added. Nearly half of previous finishing costs have been eliminated by this method

New Arc Welding Method Cuts Finishing Costs 30-50%

A 30 to 50% reduction in finishing costs has resulted through the use of new automatic-flow inert arc welding at the Cherry-Burrell Corp, Little Falls, New York.

This firm manufactures stainless-steel coolers, processors, farm tanks, and pumps to precise sanitary and engineering specifications. Finishing operations have traditionally accounted for two-thirds of its fabrication costs.

The adoption of this equipment has eliminated nearly half of these finishing costs. The new welder allows the operator to control a continuous flow of filler-metal automatically by means of a finger switch mounted on the torch, producing a smoother, less metal-consuming weld.

Prior to its adoption, the fabrication was done with conventional metal arc welding equipment. Considerable excess metal, added to each weld, had to be removed with a 36-grit grinding wheel and the weld polished with a 90-grit wheel.

Welds on sanitary vessels must be free from porosity and pinholes. When pinholes have to be filled after the polishing operation, it results in additional finishing expense. The new welder leaves almost no pinholes, according to R. F. Mager, plant process engineer.

Designed to be used with gas-shielded arc welders, the gun is basically a manual water-cooled inert-arc tungsten holder to which has been added a control switch and a gear assembly for pulling the filler metal from the spool to the arc through the gun.

To operate the new equipment, the operator merely presets the desired filler-wire speed by means of a rheostat and then strikes the arc as though it were a normal inert-arc torch. As soon as a molten pool has been established in the base metal, he pulls the trigger on the gun and the wire feeds into the arc. To stop the wire feed at any time, even during welding, he has only to release the trigger.

Rated at 250 amp, the gun accommodates tungsten from 0.040 to 5/32 in. in diameter and up to 7 in. long. It can be used with either argon or helium.

Infrared Ovens Solve Production Problem

Cleveland Electric Illuminating Co

PREHEAT OVEN at left brings metal up to proper temperature for perfect bond with insulating varnish. Motors move to varnish dip tank (center) then to infrared baking oven at right

Versatile infrared ovens have increased production and improved the quality of rebuilt electric motors at the Elliot Electric Co, Cleveland, Ohio. A uniform bake is possible in hours less time than was required with the fuel-fired convection ovens formerly used. Accurate temperature control over a wide range—up to 400 F—is obtained.

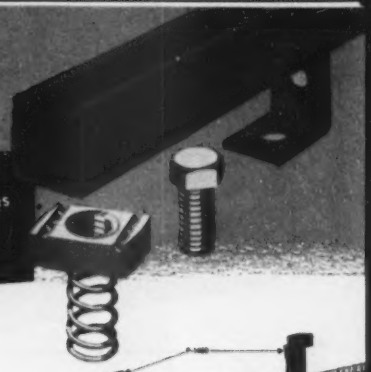
Unlike most infrared installations, the ovens are not geared for high quantity production of uniform sized parts or assemblies. The motors to be rebuilt vary in size from tiny 1/60 hp with frames only 2½ in. in diameter,

(*Continued on page* 178)

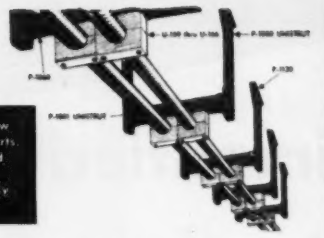
typical UNISTRUT framing applications

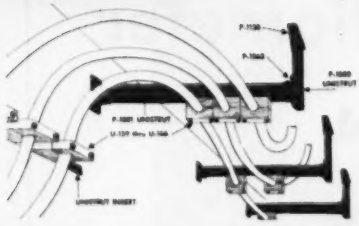
TO SUPPORT, SUSPEND AND MOUNT ALL KINDS OF ELECTRICAL EQUIPMENT

No drilling, no welding, no special tools or equipment — versatile UNISTRUT framing permits adjustments, changes or additions to be made at any time.

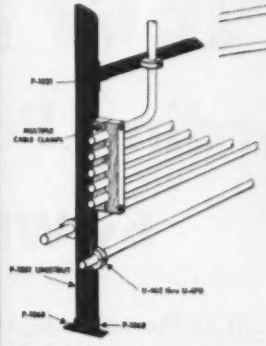


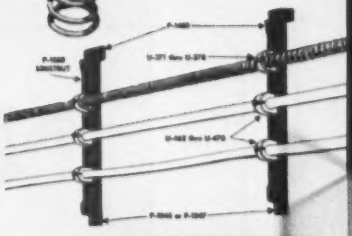
The UNISTRUT method conserves steel, reduces manpower hours, cuts overall costs.



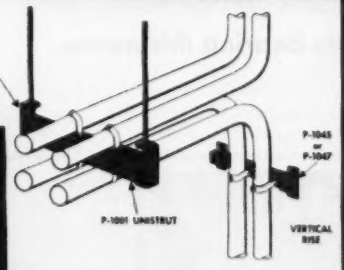


Two examples of how UNISTRUT concrete inserts, channel, fittings and maple insulating clamps support heavy overhead cable.

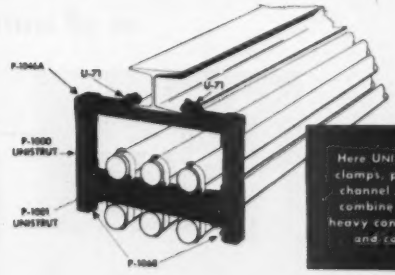




Here maple and porcelain cable clamps insulate conduit in UNISTRUT column-mounted assembly (*at left*) and cable in horizontal wall mounting (*above*).



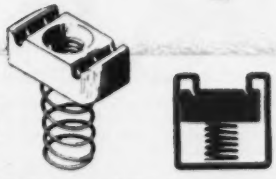
UNISTRUT framing assembly (trapeze hanging and vertical rise) supporting heavy conduit. Note how pipe clamps hold conduit firmly.



Here UNISTRUT beam clamps, pipe clamps, channel and fittings combine to suspend heavy conduit securely and compactly.

Only UNISTRUT

offers this Spring-Held Clamping Nut which ties together both sides of the slotted channel and forms a *Box Section* at points of connection for greater load strength.



Write today for your FREE Copy

of New 76-page Catalog No. 700! Includes above drawings and countless other examples of how to mount, rack, frame, suspend and support all kinds of electrical and mechanical equipment.

UNISTRUT Products are Bonderized

For Defense Production—Every day the value of UNISTRUT products is being proved by their use in Defense Industries and Armed Services installations where flexibility, and assembly and erection speed count most.

UNISTRUT®

The World's Most Flexible All-Purpose Metal Framing

UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd.
Chicago 7, Illinois, Dept. W7

Please send without obligation the items checked below:

☐ Catalog No. 700 ☐ UNISTRUT Sample ☐ Wall Chart

Name _____

Company _____

Address _____

City _____ Zone ____ State ____

Simplicity

NEW simplified Recording Potentiometer by WESTON

built to the same high standards of accuracy . . . sensitivity . . . durability as all instruments bearing this name.

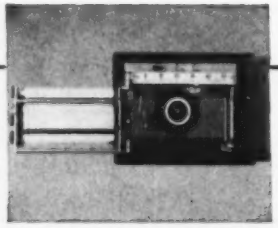


Chart frame swings out full 180° on straight pivots, chart remaining in time sequence. Charts easily installed in matter of seconds.

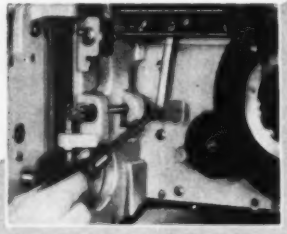
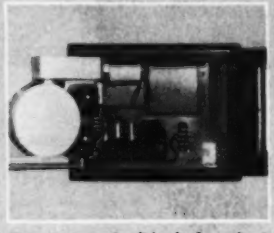


Chart speeds changed by simple screwdriver adjustment. Ranges quickly changed, too, by simply inserting correct range standard.



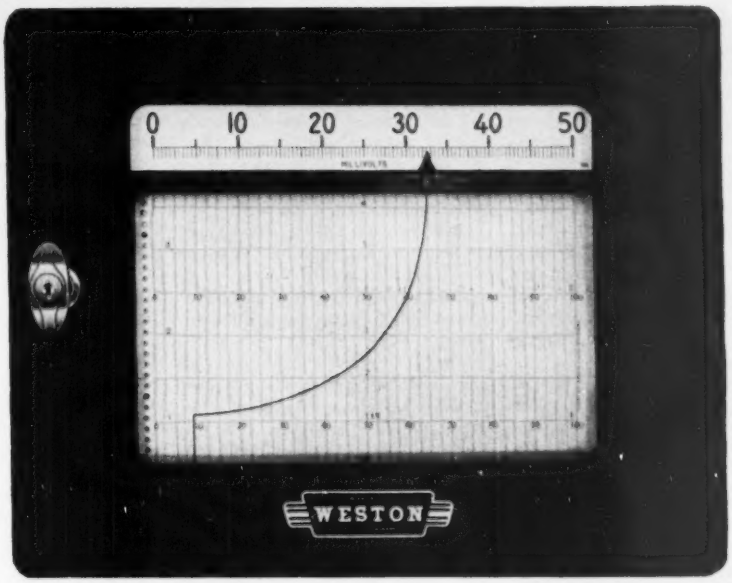
Note extreme simplicity both mechanical and electrical; as well as complete accessibility for quick maintenance and servicing.

WESTON TAB 9128

WESTON *Instruments*

INDICATE . . . RECORD . . . CONTROL

the Keynote



With this new high-speed Recording Potentiometer WESTON sets a new pattern for sound, simplified design . . . for simplicity and economy of maintenance . . . and for sustained high accuracy and sensitivity. With fewer components . . . with all assemblies greatly simplified and quickly interchangeable . . . with all adjustments including range changes made quickly on-the-line . . . with new compactness, ruggedness, and sustained high accuracy . . . this modern instrument will cut costs, and eliminate headaches wherever instrumentation is involved. You will want all the facts. Ask your local WESTON Representative, or write direct . . . WESTON Electrical Instrument Corporation, 617 Frelinghuysen Avenue, Newark 5, New Jersey . . . *manufacturers of Weston and Tag Instruments.*

Chart installation is Simpler — with new accessibility, and no loose parts to handle, chart can be installed in half the usual time. The chart drive has been simplified, made more positive, too.

Chart speed changes are Simpler — exclusive multi-speed chart drive permits instant selection of five different speeds with ordinary screwdriver. Speeds doubled or quadrupled by two simple gear changes.

Changing ranges is Simpler — you just insert correct range standard and tighten with screwdriver. Reference junction compensation changed in like manner. *No soldered connections used.* Universal slide wire needs no changing.

Pen and carriage are Simpler — pen quickly, easily filled without removal, or taking instrument out of service. Pen won't clog, never pumps or syphons-off, needs no priming after initial starting. One-piece pen carriage has oil-less bearings and is driven by woven stainless steel cable.

New Simplified ruggedness—all parts amply proportioned for strength and rigidity, to maintain mechanical alignment under tough usage.

All maintenance is Simpler — plug-in type amplifier, for example, removed in a jiffy. Liberal use of oil-less bearings reduces lubrication problems. No on-the-job soldering required.

Infrared Ovens

(*Continued from page* 174)

to 250 hp and over. Whether large or small, each motor gets a perfect three-coat finish of insulation varnish.

Since baking-time is determined by each motor's size and the type of varnish used, a day's run with each motor a different size could be an efficiency man's nightmare. It is not so with versatile infrared.

The varied production is kept in high gear by a toy-sized infrared oven, to accommodate fractional horsepower motors, and two large ovens for motors from one horsepower up. The big ovens, one to pre-heat and the other to bake, have lamp banks mounted in movable sides with tracks and rollers to adjust for motors of all diameters. Switches to cut individual lamp rows match baking heat to the motor size. When baking small motors with this set-up, as few as 25 percent of the lamps can be used.

Burned-out motors are first stripped of old insulation and windings. Then they are blasted clean with a powerful air hose. Next, the motors are rewound and placed in the infrared pre-heat oven for a short time. This process insures a perfect binding of insulating varnish to metal.

From the pre-heat oven, motors move to a varnish dip-tank, sunk in the floor, and then to the infrared baking oven. An overhead monorail system conveys motors about the plant and in and out of ovens.

Flexibility in the baking process of infrared ovens saves a great deal of time. Larger motors, requiring longer baking time, are placed at the rear of the oven. Smaller motors are placed near the doors. When time's up for the little fellows, the oven doors are opened and they are removed. Baking process of the larger motors is not disturbed. More small motors can then be positioned in the oven.

Baking time for the big motors used to hold up production for the whole shop. With infrared the oven can be opened any time and the motors removed with practically no heat loss resulting.

The small infrared oven, for the fractional horsepower motors, uses 125w lamps totaling only 3 kw. The pre-heat oven operates on 22½ kw with 250 and 375w lamps; and the baking oven uses 30 kw with 250w lamps.

Electric trucks are quiet and safe, have long life, and are low in operating cost. Picture shows truck moving collapsed cardboard containers in plant storage room. Pallets aid high stacking. K. P. Allen, Industrial Power Engineer, Duquesne Light Co, Pittsburgh, Pa.

Electric Trucks Up Storage Efficiency

Materials handling by 15 electric trucks throughout Continental Can Co's plant at Mifflin Borough, Pa., insures efficient use of storage space and aids quick handling of materials in storage and from station to station.

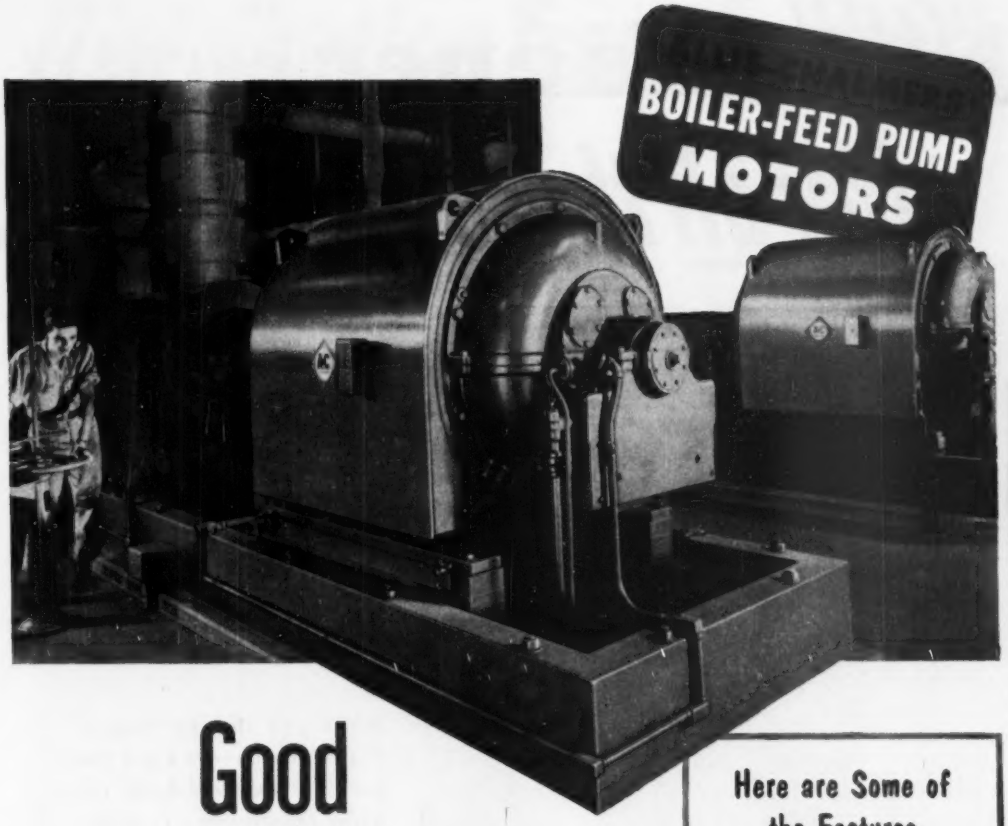
INDUSTRIAL BRIEFS

Preheating insulating transformers at Line Material Co, E. Stroudsburg, Pa., with battery of 375w infrared lamps in gold plated reflectors, removes all moisture and effects a better seal with the hot compound. Transformers are heated in their casings for 2 hr prior to filling them with insulating compound. Compound is heated in electrically heated 4400w pitch pot having ¼-hp motor for stirring compound. An additional 250w infrared lamp is used to keep compound from clogging up outlet pipe of pot. After filling with compound, transformers are again placed under the infrared lamps for about 25 min to prevent too rapid cooling and to aid in removing bubbles from compound. Blow torch method formerly used was slow and did not provide uniform heat.

Air conditioning raised hosiery production 15% during first 7 mo it was installed at Ardmore Hosiery Mills, Andalusia, Pa. Machines require adjustments at less frequent intervals with controlled temperature and humidity. Hosiery is produced in uniform length because contraction and expansion of machine parts and knitting materials are eliminated. Where seaming and inspection operations are made it prevents stuffy weather from causing let-ups in top production speed. Fewer rejects occur and employees have no tendency to take "days off." Equipment requires 33½ hp for 5000 sq ft factory area. A 9.5 kw heating cabinet is used to preset knitted hose. L. Albertson, Application Engineer, Philadelphia Electric Co.

Soldering fishing rod line guides by induction heat at Horton Bristol Mfg Co, Rockville, Conn. cuts time required from 19 sec to 1.5 sec each. Six operators now do work of 35 required with former gas operated hand torch method—wire soldering one guide at a time. Now 10 guides are dipped in solder paste and positioned in heater. When switch is closed a predetermined and accurately controlled heat is applied to the guides for 6 sec. Including time for loading and unloading jigs, applying solder and positioning jig in heater, complete cycle takes just 15 sec for 10 finished parts. One operator works at heater while five others apply flux, silver solder, pack and unpack jigs. Service by Connecticut Light & Power Co. G. E. Electronic Heater.

Comfort heating with two 30-kw space heaters (mounted at worker level) for open lean-to type structure, permits all-weather operation of dip tank painting at Macomber, Inc, Canton, Ohio. Heaters have 3-phase explosion proof motors, since a highly inflammable thinner is used—providing a rust preventative coating on fabricated steel trusses. Formerly, this operation was suspended when outdoor temperature reached freezing. Now the work can be performed when the outside temperatures fall below the zero mark. G. W. Craiglow, Industrial Power Engineer, The Ohio Power Co, Canton, Ohio.



Good Engineering Counts

—ESPECIALLY WITH 3500 HP AT STAKE

THESE 3500-HP, 3582-RPM MOTORS are driving boiler-feed pumps in a midwestern power plant. They were purchased only after a thorough check of Allis-Chalmers two-pole cage motor design details. And their operating reliability has proved that A-C engineering can meet the requirements of the largest boiler-feed pump drives in the power industry. A-3806

GET THE INSIDE STORY — For more information about large two-pole motors, ask your A-C representative for Bulletin 05B7550. Smaller cage motors are described in Bulletin 51B7693. Allis-Chalmers, Milwaukee 1, Wis.

Here are Some of the Features

- Separate steel balancing rings to provide dynamic balancing without weakening the end rings.
- *Dew-drop* bars that give better performance and stay tight in the rotor core slots.
- Forged end rings, drilled to receive the cage bars.
- Oxygen-free copper or deoxidized copper-base alloy bars and end rings to prevent embrittlement from silver-brazing.
- Air distribution arrangement that eliminates hot spots in both the stator and the rotor.
- Ring-oiling adequate for prolonged emergency operation without forced-feed oiling.
- Equalizing air pressure chambers in the bearing housings to positively keep oil out of the motor windings.

ALLIS-CHALMERS A-C

NOW...Wagner Form W offer all these features...

When you choose Wagner Transformers—you get the benefit of improved design . . . better performance . . . longer life. Then, too, Wagner has a nationwide organization to provide fast, convenient service, with branches in 32 principal cities. Bulletins TU-180 and TU-181 give complete information on Wagner Transformers.

®Wagner Electric Corporation EST 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

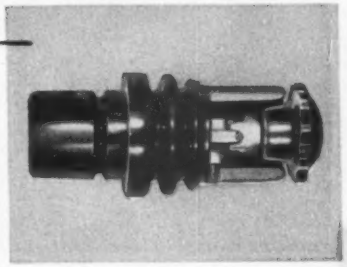
BRANCHES IN 32 PRINCIPAL CITIES

TS2-13

Distribution Transformers

1

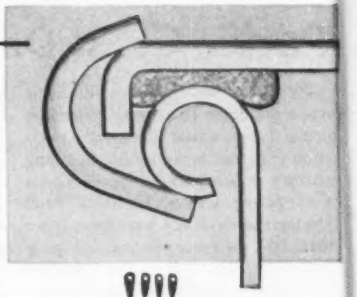
NEW HIGH VOLTAGE BUSHING



Wagner—pioneer in the use of tank wall mounted bushings—has developed a new high voltage bushing that means *faster, easier, safer* permanent transformer connections. *FASTER*—because the conductor is simply pushed in to the connector and tightened with a few turns of the knob . . . *EASIER*—no tools are needed . . . *SAFER*—the knurled knob is insulated to protect the lineman from accidental shock when tightening the terminal.

2

SHUR-SEAL COVER



Here's *true* sealed-tank construction! Covers are sealed to the tank with the Wagner SHUR-SEAL Clamping Ring. "Breathing" is completely prevented—no loss of oil can occur during shipment or handling. The SHUR-SEAL Ring maintains equal pressure all around the cover—yet permits easy accessibility by loosening a single corrosion-resistant bolt.

3

FORM W CONSTRUCTION

Wagner Form W Construction, with preformed cores of cold rolled, oriented grain steel, permits a liberal design in small size, light weight transformers that give excellent electrical performance. Core and copper losses are low . . . voltage regulation is good . . . exciting current is extremely low . . . and short time overload capacity is high. Form W Transformers pay dividends in longer service life.

4

INHIBITED OIL

Wagner pole-type distribution transformers are filled with inhibited oil, thus reducing oxidation to a minimum and retarding the formation of acids and sludge which ultimately cause its deterioration. This inhibited oil, in combination with the sealed tank construction provided by the Wagner SHUR-SEAL cover clamp adds years to the servicefree life of Wagner distribution transformers.

VERSATILITY of new liquifier is demonstrated by J. E. Shull of Southern California Edison, who concocted a special dish by whipping an egg with a jar of spinach

SELLING TECHNIQUE for deep fat fryers was subject of a lecture by Mrs. Marjorie Millie of Graybar Electric Co. She also showed how to sell blenders and coffee makers

Pacific Coast Dealers Learn to Sell Dramatically

Emphasis was on the dramatic when the home economics committee of the Pacific Coast Electrical Association gave members a course in selling recently at Southern California Edison Co's Living Center in Santa Ana. During the three-day workshop, more than 100 appliance dealers and store demonstrators from the Orange County area watched demonstrations, which stressed showmanship, customer participation, and appliances in action. Some of the showy techniques employed are shown in the accompanying illustrations of a few of the stunts devised to catch and hold attention of potential buyers.

"MAGIC ACT" by E. M. Tallon of Edison Co shows dealers how to demonstrate longevity of electric water heaters. During talk he produced three cylinders from a fourth

Water System Sales Indicate Dealer Enterprise

L. L. KOONTZ,
Appalachian Electric Power Co

In 4 months, in 1951, 4,653 automatic water systems were sold in the service territory of the Appalachian Electric Power Co. This was the accomplishment of a promotion campaign put on by the company and in which 667 dealers profited. AEP does not sell directly. Products of 70 manufacturers are represented in the total of sales in the 13 districts of the company.

Of the 4,653 systems sold, 3,942 were recorded by motor size. Of these, 1778 were ½ hp and 1,228 ¼ hp, together representing over 75% of the sales recorded by size. Motors of 1 hp and less accounted for nearly 99% of them.

Examination of the sales record as tabulated by makes of systems sold in the 13 company districts gives emphasis to the importance of the local dealer in reaching the rural market.

How Sales of Water Systems Compare by Makes in A E P Co Districts

	Company Districts												
Rank	1	2	3	4	5	6	7	8	9	10	11	12	13
1st	E	F	D	D	AD*	A	C	B	AF*	B	A	A	A
2nd	A	E	A	A	B	C	D	C	B	A	D	B	G
3rd	F	N	E	E	F	D	B	A	G	W	G	G	B
4th	J	B	F	C	E	B	A	G	C	JS*	G	D	C

* Indicates two makes tied for place.

In total of sales in all districts one make was first by a large margin. But it was first in only 4 of the 13 districts, was tied with another 2, and was behind in 7, as is shown by the accompanying table of standings in which the different makes are designated by letters, A, B, C, etc. which indicate rank in total sales. For instance, in district No. 2, make F is first, although 6th in total sales. These standings indicate how different makes were pushed in the local markets by dealers. The large differences in sales of the same make in the various company districts are a revealing index of dealer enterprise.

Here's an Easier Way

to install Gang-Operated Switches

CHANCE WN-VN SWITCHES

permit quick installation of interphase shaft without "threading"

Chance Tilting Insulator Switches for outdoor gang operation give you always reliable switching under all conditions. The reason? . . . Such operating advantages as the exclusive Compensator Control Mechanism that means positive performance under all conditions—"Crow Bar" Leverage that breaks heavy ice with ease—Compensation for structural warpage—and *New Ease of Installation*.

WN-VN Switches *are* easier to install than any other gang-operated switches. The arrows in the illustration above point out the features that make installation simple.

1. The flanged base has double slots and slotted holes for ready installation on all standard construction. (Front mounting brackets are supplied for steel structures.)

2. The clamp on each switch swings open to permit the interphase shaft to be laid in position *after* the switch units are mounted.

3. The interphase shaft bar is then inserted in all three phases at once—without the necessity of "threading" through small fittings.

4. Easy adjustment (only necessary under unusual conditions*) is accomplished by pulling the stainless steel pin which connects the compensator control rod, loosening the lock nut (4), and turning to adjust.

All control connections on Chance WN-VN Switches are made with clamp type fittings for maximum flexibility.

Rugged "torture rack" tests prove that the performance of these switches is not affected by any conceivable warpage of cross-arms—Ice tests prove their exceptional ability to open and close without difficulty when coated with over ¾" of hard, clear ice. Chance WN-VN Switches can be isolated, while energized, with Hot Line Tools for live line maintenance.

For reliable switching *plus* time saving installation advantages, specify Chance Type WN or VN Switches.

Send for complete catalog information or test data or consult Section 11B of your Chance catalog.

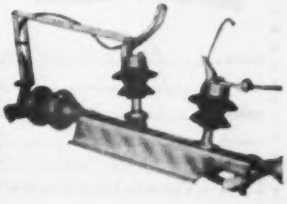
**All WN or VN switches are factory adjusted for proper contact and gap clearance before shipment.*

You know it's RIGHT when you specify CHANCE

A·B·CHANCE CO.

CENTRALIA, MISSOURI

SAN FRANCISCO, CALIFORNIA



Chance Type VN 200 Amp. Switch. A two-insulator tilting type switch built for service and economy.

C52-10

for
custom-engineered
POWER

look to.. EP

Since 1909, the job of The Electric Products Company has been to create and develop special electrical rotating equipment . . . motors and generators to do existing jobs better or to reach into new fields to do jobs that couldn't be done before. The natural "by-product" of our more than 40 years of specialization is that you get equipment designed and built to the exact requirements of your application . . . equipment that has greater dependability, longer life and that requires less maintenance.

Send in the coupon below for detailed information about our Custom-Engineered synchronous motors and generators . . . d-c motors and generators . . . induction motors . . . battery chargers . . . frequency changers.

A nation-wide sales engineering and service organization stands ready to meet all User requirements.

THE ELECTRIC
PRODUCTS COMPANY

1751 CLARKSTONE ROAD
CLEVELAND 12, OHIO

Attach coupon to your letterhead for your copy of Bulletin 2-206

NAME_____
TITLE_____
COMPANY_____
STREET_____
CITY_____ ZONE____ STATE_____
2-56

Movie Describes Home Lighting Recipes

"Bright Future," a new full color movie, dedicated to improving home lighting, has been released by the Lamp Division of the General Electric Co. The 29-minute picture dramatizes what "light conditioning" can do to change the homes and lives of individuals in an average family. It is based on the 22 lighting recipes developed by GE residential lighting specialists.

In the above picture, one of the families portrayed in the movie is shown putting the finishing touches on the valance lighting in its early American living room. Prints of "Bright Future" are available through the 35 sales districts of GE's Lamp Division.

T-17 Fluorescent Lamps Prove Worth in School

Utility and labor-saving qualities of the T-17 fluorescent lamp are indicated in a report released recently by the Sheboygan Christian School, Sheboygan, Wis. School officials expressed their satisfaction following a year's use of the T-17s, which provided the needed 40 ft-c with approximately half the brightness and glare of the standard T-12s.

They were happy on several other counts:

1. The low brightness lamps relieved the necessity of louvers or baffles, reducing dust trapping areas.

2. Apertures at top of units afforded almost no horizontal surface to get dirty.

3. Open type fixtures installed crosswise instead of lengthwise afforded a more even light distribution on the front blackboards.

4. Desk top glare was reduced by half.

5. After a year, none of the 128 fixtures manufactured by the Commercial and Industrial Fluorescent Lighting Division of the Mitchell Manufacturing Co, Chicago, required maintenance.

Predicts 40 Million TV Sets in 5 Years

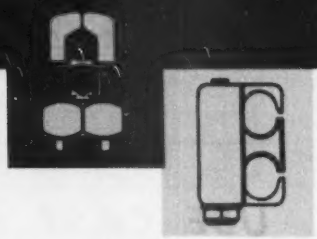
"Of all our products, television has had the most spectacular growth and holds the greatest promise of the future", said William Balderston, president, Philco Corporation, recently to Philco distributors. He continued,

"Only 55% of our population is being served by the 109 TV Stations that are now on the air. Within five years there will be 5 or 6 hundred stations blanketing the country and bringing TV service to 90% of our population. Over 10 million small screen TV sets will soon become obsolete and this replacement market will be a substantial factor in the growth of our industry. We are al-

A timely message to new users of aluminum—

25,000,000

can't be wrong



*split bolt and vise-type

There are no new problems in making satisfactory electrical service connections with aluminum conductors . . . just new interest.

The same well-known manufacturers who have produced more than a billion split bolt and vise-type connectors . . . who have designed and produced in the last 20 years 25 million connectors for aluminum . . . are logically your best source of supply and information in today's growing use of aluminum conductor.

Problems of galvanic corrosion, cold flow and oxidation in aluminum find their answers in the standard split bolt and vise-type connectors of these manufacturers. Versatile, convenient, compact, economical, reusable—these proved-in-use connectors are available in aluminum alloy, plated copper alloy and with bi-metallic or plated washers.

The principle is simple: *The proper connector and proper cleaning plus use of oxide inhibiting compound will answer any aluminum connector problem for any type of connection.*

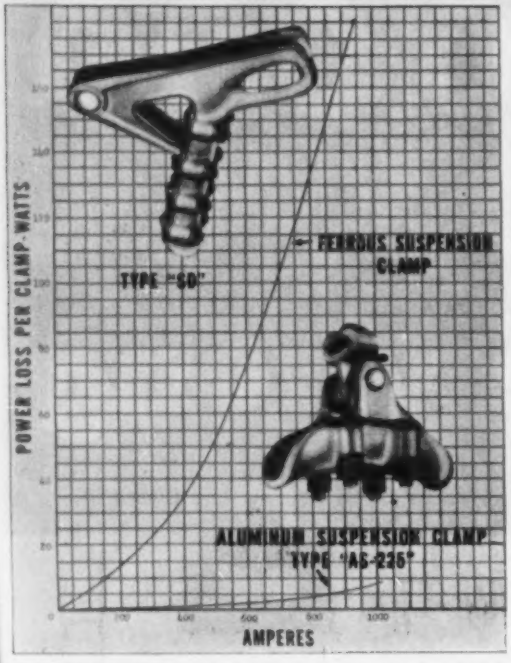
If special problems do arise in your particular business or application, consult any of the manufacturers direct.

Electrical Service Connector Institute

A NON-PROFIT ORGANIZATION DEDICATED **ESCI** TO MORE EFFICIENT ELECTRICAL SERVICE

370 Lexington Avenue, New York, N. Y.

Jasper Blackburn Corp. • Burndy Engineering Company, Inc. • Fargo Manufacturing Company, Inc. • James R. Kearney Corp. Line Material Company (Division of McGraw Electric Co.) • Penn Union Electric Corp. • Reliable Electric Company



Backed by many years of coordinated electrical, mechanical and metallurgical engineering knowledge and experience in the design and manufacture of cast aluminum products for the electrical industry.

USE CAST ALUMINUM

TYPE "AS" SUSPENSION AND TYPE "SD" STRAIN CLAMPS

ON ALUMINUM TRANSMISSION LINES

STOP—Hysteresis and eddy current power losses.

PREVENT—Corrosion, heating and annealing damage to conductor within clamps.

ELIMINATE—Jumper splice failures—use through conductor strain clamps with continuous jumpers at strain points.

BE SURE—SPECIFY—Cast aluminum clamps with more than 25% greater strength.

WRITE FOR *Catalog No. 320*

Consult one of our nearest 18 representatives or contact our main office.

OUR PRODUCTS ARE QUALITY CONTROLLED FROM INGOT TO FINISHED PRODUCT

ANDERSON BRASS WORKS, Inc.

POST OFFICE DRAWER 2151

BIRMINGHAM, 1, ALABAMA

ready beginning to feel the effects of a second set in the home and adding these factors together, it is safe to predict that there will be 40 million TV sets in use within the next 4 or 5 years."

Limited Space Kitchen Unit

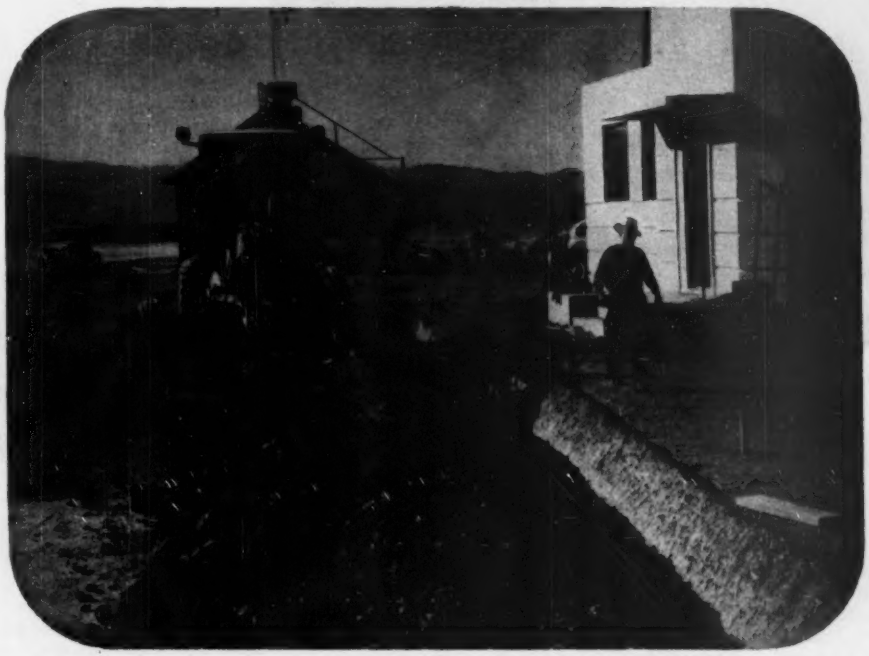
A complete electric kitchen designed for installation in only 60 in. of wall space was recently announced by Westinghouse. Equipment for the unit includes: a 4-cu. ft. under-counter re-

frigerator, a four-unit electric range, stainless steel work surface and sink unit, one 15-in. sink cabinet and two 30-in. wall cabinets. The complete assembly carries a suggested list price of $600.42.

Easier Ironing

It is possible for women to apply to ironing some of the methods which have simplified work in industry. A booklet issued by Proctor Electric Co's Information Center proves how worthwhile the results of doing so can be. Titled "Old Versus New Ironing Methods," the booklet is a comparative study of ironing methods, done at Columbia University's Teachers College by Margaret C. Coleman, a candidate for a doctor's degree. Using the Mary Proctor ironing simplification techniques, the author shows that once the basic elements of time and motion economy are learned, they can be applied by anyone to any article in the laundry basket. Copies may be obtained for 10 cents from Proctor Information Center, 480 Lexington Ave, New York 17, N Y.

PARKWAY CABLE



Save the cost of duct systems!...with the most dependable Parkway Cable you can buy!

ROEBLING'S research staff is continually working at the job of product development. Our manufacturing facilities and techniques are constantly improved. That's why our Parkway Cable for distribution and general power supply circuits is today even more dependable than ever before.

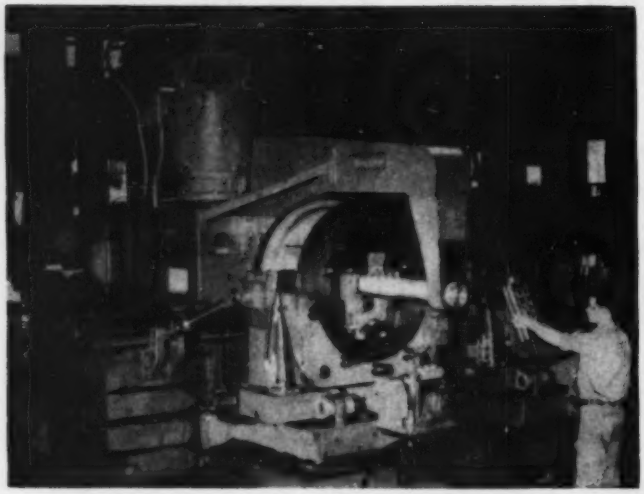
Roebling Parkway Cable saves money right from the start because it is buried directly in a shallow, low-cost trench. It is made in single and multiple conductor — solid or stranded — in a range from 600 to 5,000 volts . . . furnished with metallic armor or a non-metallic *Roeprene* sheath, depending on the physical protection required. Types that pass all C.A.A. requirements for Specification No. L-824 for airport lighting are also available.

Large quantities of Roebling's full line of electrical wires and cables are needed in the rearmament program. We and our distributors will do everything possible, however, to meet your requirements. John A. Roebling's Sons Company, Trenton 2, N. J.

ROEBLING

ATLANTA, 924 AVON AVE • BOSTON, 51 SLEEPER ST & 5 PITTSBURGH ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3563 FREDONIA AVE • CLEVELAND, 701 ST. CLAIR AVE, N. E. • DENVER, 4801 JACKSON ST • DETROIT, 919 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 9340 E. HARBOR ST & 150 S. HEWITT ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1930 E. 2ND ST • PHILADELPHIA, 230 VINE ST • PITTSBURGH 1301 CLARK BLDG • ROCHESTER, 1 FLINT ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 3001 DELMAR BLVD • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY

NEW EQUIPMENT



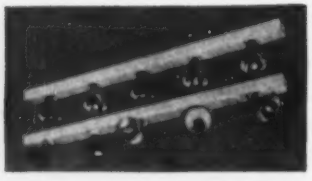
Reversing Motor

A dc motor of low inertia (small diameter armature) and high flux (strong field) has been designed to meet the fast reversing requirements for high production machines. This motor makes use of two electronic circuits to impose, briefly, several times normal voltage on both motor armature and field.

Controlled within pre-determined current limits, these forcing circuits make it possible while maintaining maximum torque to reverse the motor rapidly. The consistency of point of reversal is maintained because of a minimum of overtravel.

The new motor with its associated generator and electronic controls will be available in sizes from 1 to 500 hp and is force-ventilated with air supplied by an integrally mounted blower.

Reliance Electric & Engineering Co, 1088 Ivanhoe Rd, Cleveland 10, Ohio.

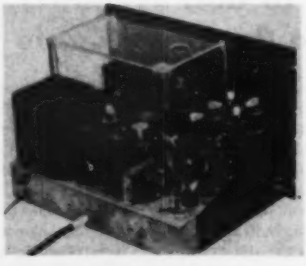


Display Lighting

A new development in display lighting, called Roto Strip, is a compact, shallow unit with inbuilt swivel sockets. The sockets have fingertip adjustment and can swivel 90 deg in all directions through 360 deg.

The Roto Strip is manufactured in 2, 3, 5 and 8-ft lengths and can be combined if a greater length is desired. It is available for ordinary straight installations, for corner mounting, and with a reflector to shield the light. The lights will stay in place at any angle.

Neo-Ray Products, Inc, 315 E 22nd St, New York 10, N. Y.



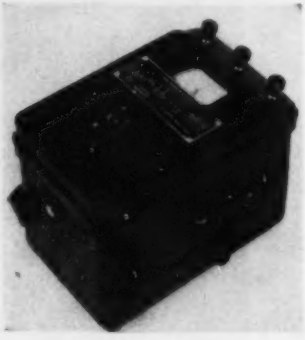
Power Unit

A continuously variable 1-30kv regulated dc power supply unit called the Model LAB-30 has recently been introduced. It has regulations of ½ of 1% of 1 ma. Up to 2 ma may be drawn from 20kv down. This 16-tube unit consists of a separate oscillator and buffer feeding the power oscillator into a double rectifier. Regulations are accomplished through feed-back into a dc amplifier plus simultaneous output control of the buffer. Other models are available for use up to 40 kv. It is made in both rack and bench models.

Spellman Television Co, Inc, 3029 Webster Ave, Bronx, N. Y.

Ohm Meter

Model "JP" ground-ohmer is an instrument used for earth resistance measurements for power plants, high voltage lines, lightning arrestors and soil investigations. It operates on the potentiometer or drop of potential



principle and incorporates a hand cranking ac magnetogenerator.

It is contained in a plastic top metal case with a carrying strap. A pair of heavy duty ground rods, cables 66/33/11 yd long, ground clamps and carrying cases are furnished.

Earth resistance is found by a single measurement. The instrument is direct reading in ohms, has three measuring ranges, namely, 10, 100 and 1000 ohms, and has 300 scale divisions.

Herman H. Sticht Co, Inc, 27 Park Place, New York, N. Y.

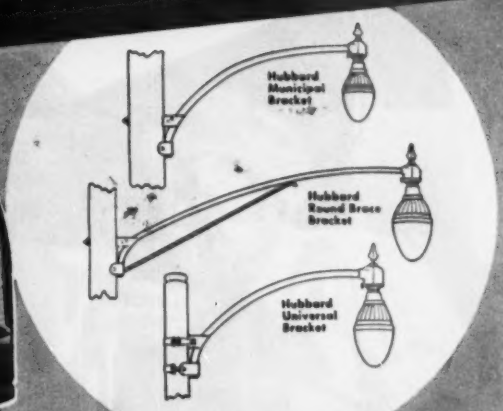
Heater Switches

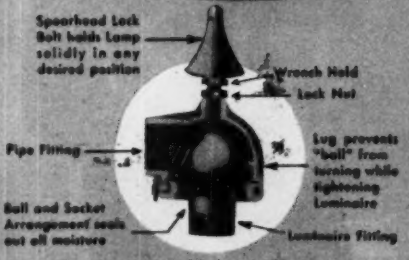
Series 850 heater switches have connections made by pushing the stripped end of a standard solid or stranded service conductor into one of the switch's autolock connections. A spring clamp automatically locks the wire in place with a positive connection. For rewiring, immediate release is obtained by depressing a lever.

Small, they can be close mounted either in line or cluster arrangements

(*Continued on page* 192)

THE *Adjustable* HUBBARD LEVELITE* SOLVES STREET LIGHTING PROBLEMS




Spearhead Lock Bolt holds Lamp solidly in any desired position
Wrench Hold
Lock Nut
Pipe Fitting
Lug prevents "ball" from turning while tightening Luminaire
Ball and Socket Arrangement seals out all moisture
Luminaire Fitting

A maximum swing of 34° is possible in any one direction, 17° in any direction from the vertical, or center line of the Levelite.

Furnished with 2-inch pipe thread to fit 1½-inch or 2-inch pipe threaded Luminaire; and with 1½-inch pipe thread to fit 1½-inch pipe threaded Luminaire.

*NOW AVAILABLE IN HAPCO ALUMINUM ALLOY AS WELL AS IN GALVANIZED MALLEABLE IRON

The Hubbard LEVELITE allows a wide flexibility in adjusting the luminaire for street lighting installations. Luminaires may easily be plumbed and leveled, even though the pole is as much as 17° from vertical in any direction. Or, they may be purposely tilted to avoid obstructions in the desired path of illumination.

The LEVELITE uses a ball and socket movement, which effectively seals itself against moisture. Permanent setting is maintained by a single "spearhead" bolt and lock nut. Changes in the angle may be made easily and quickly, before or after installation.

Hubbard LEVELITES make an ideal combination with Hubbard Upsweep Street Lighting Brackets, made of Hapco Aluminum Alloy, or steel. Write for bulletins describing them if you don't have copies in your files.

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

Facts from
NEW YORK

"'CSP' Transformers save us $16,000 a year"

"92% fewer outages . . . savings of approximately $16,000 a year . . . that's the record of 'CSP' Transformers compared with conventional types of transformers on our lines," says a leading utility in New York State.

"Records recently completed, covering a period of years, show that burnouts from lightning took 0.784% of the installed capacity of conventional transformers, compared with 0.062% for the 'CSP' Transformers on our system."

Installation and maintenance costs for Westinghouse "CSP" (Completely Self-Protecting) Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following:

NATIONAL AVERAGES

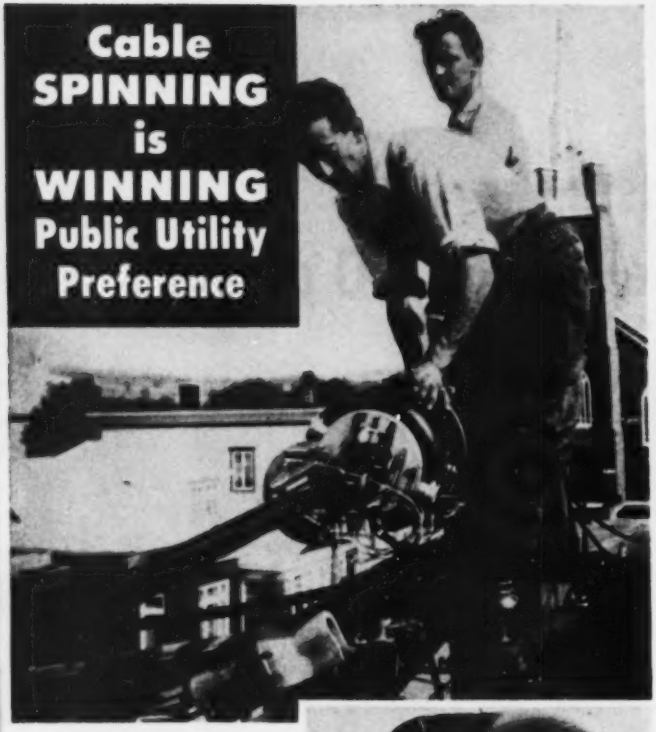
	"CSP"	Conventional
Installation Costs	$13.87	$24.74
Burn-out Rate	0.257%	1.005%
Fuse Outages	None	5.64% @ $6.52 per outage
Load Checks	Automatic	12.8%
Breaker Reset	1.02%	None

If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet 4247-B, "Transformer Costs and Their Relation to Profits". Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

"CSP" devices . . . originated and patented by Westinghouse

J-70592

Cable SPINNING is WINNING Public Utility Preference



More and more public utilities every day are turning to the Neale Model "K" Cable Spinner—specially designed for economical and efficient power line use. And here are some of the benefits . . .

It actually costs much less to install spun cable than pre-assembled cable. And, of course, spun cable saves valuable space in open-wire construction in congested areas.

Light weight single conductor cables may be spun in lengths three times as long as pre-assembled cables . . . to save splices and installation labor.

Spinning reduces cable inventories, because 1/c, 2/c and 3/c cables can be spun in the field as required.

Cable spinning provides a big margin of extra protection against storm damage . . . and has proved invaluable in emergencies of all kinds.

You're invited to send for full technical details on the Neale Model "K". Just drop a line to Cable Spinning, Topeka. *Neale Spinning Wires available in seven different types and sizes.*

Main illustration shows spinning of cable in Canada. Inset is close-up of the Neale Model "K" Cable Spinner, with accessory tools. Model "K" spins a single cable or three 2" cables into a compact triangular pattern. Strand lies in groove formed by two top cables.

HOW IT WORKS. Drum rotates when its two friction drive wheels respond to pulling of wire. Drum revolves once when 15' of wire is pulled — regardless of condition of strand. Drum carries two spools of wire, spaced to spiral 6½" apart for ample cable support. Magnesium castings used wherever possible for lightness and strength. Weight is only 36 pounds. Length 18½", 12" diameter, 4¾" wire exit.

THE WORLD IS SPINNING—TOO

Cable Spinning Equipment Co.

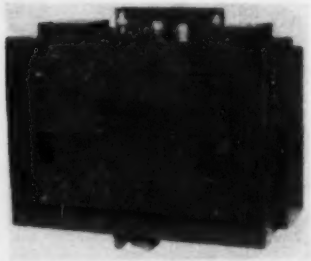
3100 TOPEKA AVE. TOPEKA, KANSAS

Equipment

(*Continued from page* 188)

to save space and simplify assembly and operation. They will be available in standard, heavy and horsepower ratings in a variety of standard and special circuits including off-on, 3, 5, 7 and 9-heat circuits with one or two-hole or special mountings.

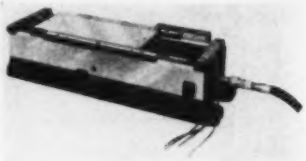
Hart Mfg Co, Hartford, Conn.



Power Controller

A new design of refinery type limitamp (Class 1, Group D, Div 2), approximately 60% smaller in size and priced about 23% lower than former models has been announced. The use of a manually operated, oil-immersed explosion-proof disconnect switch in the primary circuit of the control transformer has eliminated the additional cubicle previously required for control power. This and a shallow inclosure permits the reduction in size. Redesigned limitamp is 90 in high, 34 in wide, and 40 in deep.

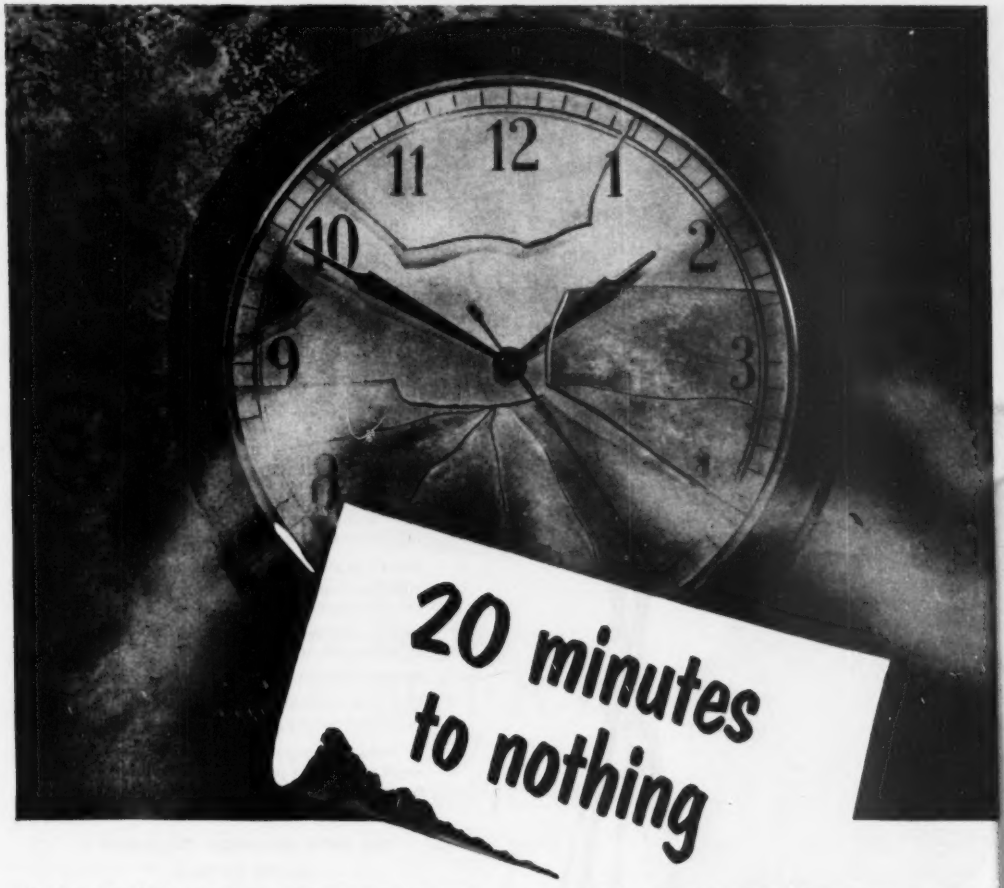
General Electric Co, Schenectady 5, N. Y.



Air Powered Work Feeder

In order to cut "idle" machine tool time in half a new 2-station electrically controlled air powered work feeder has been designed. It consists of a movable mild steel table too 11/16 in. thick by 5¾ in. wide by 12 in. long which is guided between hardened and ground dovetail ways.

The work feeder has a 6-in. transverse positioning stroke allowing the operator to load and unload at one



You could know the plant... 20 years of steady growth ...20 years of work, brains and money... then in 20 minutes a little fire got away and reduced it all to nothing.

But, your larger size fire hazards can be protected very efficiently at a reasonable cost, thanks to C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing Systems. Simple piping, running from one centrally located storage tank, instantly transports clean, non-damaging, non-conducting carbon dioxide anywhere in the plant area... to flammable liquids, electrical equipment, storage spaces, manufacturing processes and record vaults. Fire at any protected location is extinguished in seconds with an absolute minimum of expense and interruption.

Flexibility is the keynote with these C-O-TWO Fire Extinguishing Systems . . . the low pressure carbon dioxide storage tanks range in capacities from one to fifty tons . . . discharge facilities can either be manual mechanical, manual electric, automatic mechanical, automatic electric or a combination of these . . . especially installed to fit your particular needs. Future plant expansion is easily and economically provided for by initially installing an oversized low pressure carbon dioxide storage tank and adding the supplementary discharge facilities at a later date.

Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . C-O-TWO means experienced engineering that assures you of the best type equipment for the particular fire hazard concerned.

WHEN BUSINESS STOPS . . . INCOME STOPS!

Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

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Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

"For the Record"

PENTA* has a superior performance record in the protecting of wood from termites and rot.

PENTA is a widely accepted wood preservative and is a standard of the American Wood Preservers Association.

PENTAchlorophenol is a chemical of constant, uniform effectiveness.

PENTA is clean . . . poles are easy to handle.

PENTA is available—over 60 commercial treating plants can supply clean crossarms and poles.

A technical representative, experienced in wood preserving problems, is available to help you make all wood structures last longer.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

The Dow Chemical Company
Dept. PE 11, Midland, Michigan

- ☐ Send me free booklet "Pointers on Penta".
- ☐ Send me list of Penta treating plants.
- ☐ Please have technical representative call.

Name _____ Title _____

Company _____

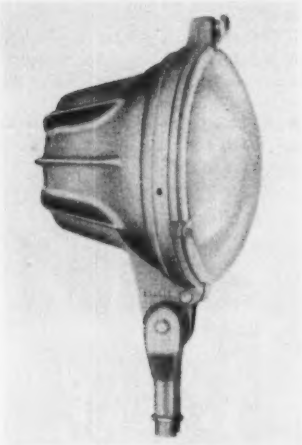
Address _____

City _____ State _____

DOW
Penta
chlorophenol

end while the machining operation is taking place at the other. It can be operated by push button, floor switch or interlocked with other machine elements.

The Bellows Co, Akron 9, Ohio

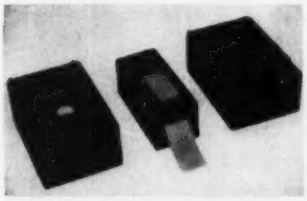


Floodlight Fixture

Having a streamlined contour to reduce wind resistance, the Sterber S-400 lighting fixture is designed for use with the PAR-56 sealed-beam, 1,000,000 CP, 300-w lamp. It is available with or without heat resisting lens.

The cast aluminum housing with cooling fins for rapid heat dissipation has an articulated weatherproof adjusting joint for universal aiming. Wiring is fully enclosed. Mounting arm is threaded ½ in. to fit all Sterberlite cluster and unit mountings. The lamp is held in position by a hinged ring.

Sterber Mfg Co, Broadview, Ill.



Welding Analyzer

Single-phase and three-phase resistance welding machine variables are now recorded by a new direct writing instrument called the Welding Anal-

SUPERVISORY CONTROL is OUR job!

Supervisory Control as it applies to the electric power equipment field is a limited field and a highly specialized one. We do not attempt to cover the entire spectrum of electrical equipment, *a la* the big do-it-all company. Our concern is specializing in supervisory control in order to do a better job.

To do this means being better equipped to give you more for your product dollar. It means the ability to provide proven circuits and components in equipment more suited to your particular needs. It means production know-how. It means experience that comes from confronting—*and solving*—similar problems day in, day out. And it means better service, a factor extremely important and oft neglected these days.

This sum total of experience never appears in a list of specifications. But it's in all Control Corporation equipment you buy, and you pay nothing extra for its extra value.

Specify Super-Trol, Control Corporation's specialized method of supervisory control. It will cost you *less* in the long run.

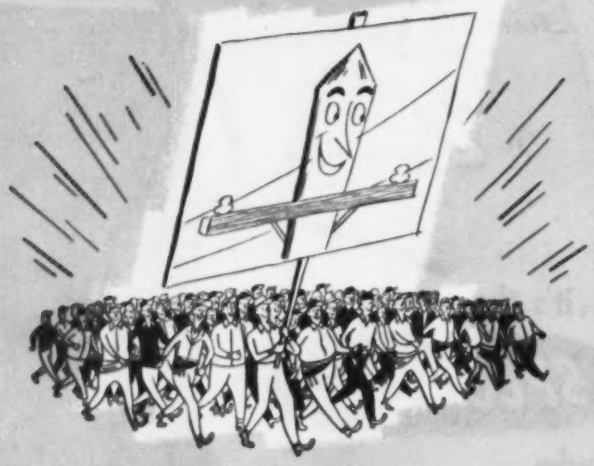
Write for Bulletin AA-2. It shows you what we mean by "specialized experience".

CONTROL CORPORATION

719 CENTRAL AVE N.E. MINNEAPOLIS 14 MINN

· Super-Trol · Peak-Trol · Telemetering · Battery Chargers · Carrier Current ·

at the poles . . .



linemen vote for clean, certain Penta protection

When linemen go to the poles, they cast a rousing vote for PENTA. They know from their own experience that PENTA-treated poles are clean . . . easy on their clothes and body. They also know these poles are sound and safe . . . free from shell rot, top rot, ground line decay and insect damage.

Management votes for PENTA because they can absolutely depend on it to give poles long life and minimum maintenance. That's because PENTAchlorophenol is a powerful, stable and uniform wood preservative—gives measured and positive protection. It's always the same! Penetrates deeply and won't evaporate or wash away. Doesn't affect conductivity, creates no special problems.

Specify PENTA treatment for safeguarding your poles, cross-arms and other wood construction. It costs no more than other types of wood preservation. Write us for complete facts and the names of companies supplying PENTA-treated forest products.

CHAPMAN CHEMICAL COMPANY

Dermon Building, Memphis 3, Tenn.

333 N. Michigan Ave., Chicago 1, Ill.

CHAPMAN

Penta Preservative

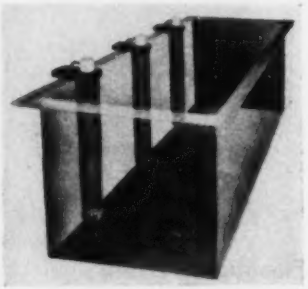
It's Clean! It's Certain!

Conforming to A. W. P. A. Specifications P8-49 and P9-49

yzer. Electrode force and welding current are measured and recorded simultaneously and show the important squeeze, weld, hold and off-time intervals. Also recorded is the small 180 cycle per second component present in the three-phase welding machine current when ignitron rectifiers are used.

The welding engineer can adjust the welding machine as the measurements are being made, because of the availability on an oscillograph.

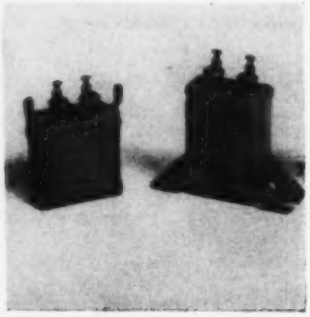
Brush Development Co, Instrument Div, 26E, 3405 Perkins Ave, Cleveland 14, Ohio



Immersion Heater

The "Glorod," an immersion, fused quartz heater, is totally inert to acids and requires no cleaning or maintenance. The fused quartz eliminates "stray" currents in electroplating work, and the units will be useful in electropolishing and electroplating baths as well as phosphatizing solutions. A line of standard sizes is made available.

Cleveland Process Co, 7016 Euclid Ave, Cleveland, Ohio

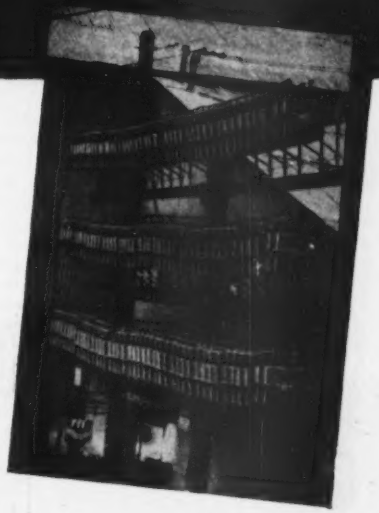


Industrial Capacitors

The Stabelex "D" capacitor has recently been developed for capacities

LARGE SOUTHEASTERN SYSTEM *reports:*

FROM ITS C-D CAPACITORS



Called upon to supply enormous quantities of power to vital government plants, this utility is extremely "power-factor conscious." To date, C-D capacitors have delivered over 500 million Kvar hours of trouble-free service for this utility, under the most severe operating conditions! This outstanding field performance record is typical of more than 4,000 C-D power-factor installations made in the past decade.

a real test for capacitor dependability!

C-D installation shown is at the Southern Ferro Alloys plant. The large open type furnace (in background) runs well over 3000°F. This, plus the summer sun, corrosive fumes, etc. is a most severe test of the capacitor installation's ruggedness.

A C-D engineer will be glad to point out the many dollar-saving characteristics of C-D capacitors.

CORNELL DUBILIER ELECTRIC CORP.
DEPARTMENT D 72 A
SOUTH PLAINFIELD, N. J.

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER CAPACITORS

PLANTS IN: SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER, CAMBRIDGE, MASS.; PROVIDENCE, R. I.; INDIANAPOLIS, IND.; FUQUAY SPRINGS, N. C. AND SUBSIDIARY: THE RADIANT CORP., CLEVELAND, OHIO

for positive control of street lighting

The
FISHER-PIERCE
Series 63300B
PHOTOELECTRIC
CONTROL

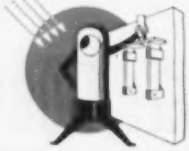
PHOTOELECTRIC CONTROL means the added *safety* of street lighting *when it is needed* — regardless of time of day, season, climate or weather conditions. Control is fully automatic. Even after temporary line power failures the control operates correctly with no need for manual resetting.

FISHER-PIERCE Photoelectric Controls for street lighting have proven themselves in over 35,000 installations made by more than 700 electric utilities.

The electronic circuit of the Series 63300B control provides dependability made possible by over seven years of practical experience. Amplifier tubes consistently have a life of more than 20,000 hours. Other components have much longer life. Units are rated 2500 V. rms hipot to give maximum resistance to the effects of lightning transients. The built-in contactor is conservatively rated to handle a 3000 watt lighting load. The unit has Standard meter socket plug-in construction with cross-arm mounting bracket which gives great installation flexibility.

The control itself gives *truly* economical (*low* purchase cost, *low* installation cost and *low* maintenance cost) and effective service backed by an extensive engineering service organization field experienced in street light control application.

Write for Bulletin 63300B.



The FISHER-PIERCE CO., Inc.
82 Pearl St., So. Braintree, Boston 85, Mass.

EXPORT: PHILIPS EXPORT CORP. 100 E. 42nd STREET NEW YORK 17, N.Y.

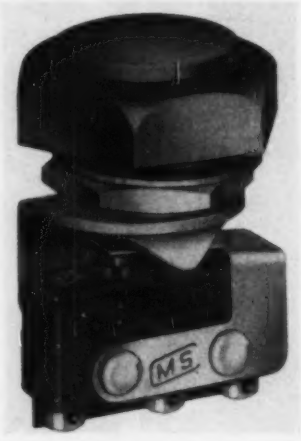
IN CANADA: NORTHERN ELECTRIC CO., Ltd.

ranging from 0.00005 mfd 600 v dc to 25 mfd 400 v dc. Power factor at 20 C and 1 kc is 0.00025.

These capacitors reportedly will hold their charge for as much as 200 days, which makes possible computers that can store information for an extended period of time.

Type D capacitors are hermetically sealed. Case material is lead coated steel. Terminals are specially prepared and treated glass, stand off type. Winding is non-inductive.

Industrial Condenser Corp, 3243 N. California Ave, Chicago 18, Ill.



Pushbutton Switch

A compact, weather- and oil-proof pushbutton switch weighing 1 oz with a double-pole, double-throw assembly is so small that it will fit inside of a walnut shell.

Panel mounted, the switch is sealed against oil, water and dirt by synthetic sponge rubber. No sliding joints are required and the small movement required to operate the switch is provided by resilience of the seal.

Both single-pole and double-pole switch assemblies are listed for 5 amp, 250 v, ac and either type will control 30 v dc inductive loads of 2 amp at sea level and 1½ amp at 50,000-ft elevation.

Minneapolis-Honeywell Regulator Co, Micro Switch, Freeport, Ill.

Plastic Tape

Though only 7 mils thick a new plastic tape will withstand 10,000v and has an insulation resistance of

2 WAYS TO MEET YOUR ALUMINUM CONNECTION REQUIREMENTS with FARGO "One-piece...Vise-type" CONNECTORS

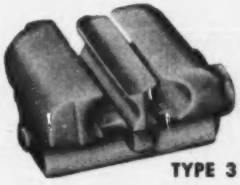
1

The FARGO "9000" Series for **like-metal** contacts

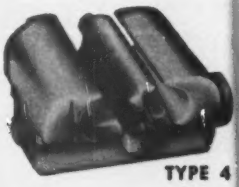
. . . comes in four types: TYPE 1—for aluminum-to-aluminum—and TYPE 2—for aluminum-to-copper—are for smaller wire sizes, up to and including 4 ACSR. TYPE 3—for aluminum-to-aluminum—and TYPE 4—for aluminum-to-copper—are for larger wire sizes, above 4 ACSR. ALL FOUR TYPES are designed to provide wider contact areas on conductor surfaces, with "like-metal" contacts to minimize galvanic corrosion. They are MASSIVE for better conductivity and greater heat dissipation—and are of "one-piece" construction for ease of handling and installation.

TYPE 1

TYPE 2



TYPE 3

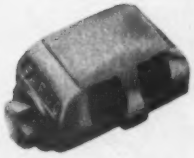


TYPE 4

2

The FARGO "8000" Series Plated for **all-purpose** Connections

. . . utilizes a bronze body and copper spacer. Spacer provides good area of contact between conductors—hence good conductivity . . . low "cold flow". Liberal spacing also minimizes galvanic corrosion of dissimilar conductors. Also, "one-piece" construction—plated for friendly contact with aluminum. Fits wide ranges of conductor sizes—thus reducing the number of connector sizes to be stocked.



. . . "built like a vise — grip like a vise."

Ask your Line Material Field Engineer to give you complete details.

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

Poughkeepsie, N.Y.

Distributed by

LINE MATERIAL COMPANY

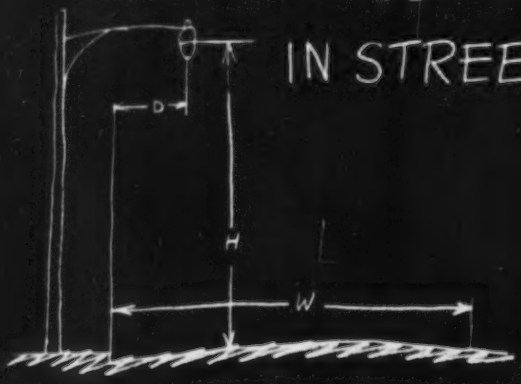
(A McGraw Electric Company Division)

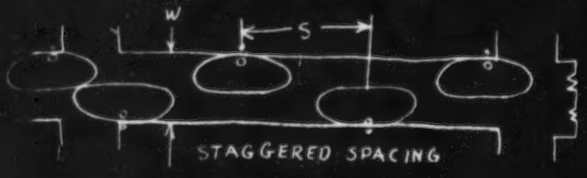
Milwaukee, Wisconsin

LM

No. 1 in a series

PRACTICAL PROBLEMS TO CONSIDER IN STREET LIGHTING . . . . .





TYPICAL LAYOUTS

Necessary steps in calculating for "maintained" illumination

1. Classify your street:
2. Type of pavement:
3. Illumination values required:
4. Calculation procedure:

$$\frac{\text{spacing between lamp lumens at luminaire - 70\% of rated life} \times \text{C.U. of U.} \times \left(\frac{\text{luminaire}}{\text{maint. factor}}\right)}{\left(\frac{\text{Average footcandles}}{\text{in service}}\right) \times (\text{width of roadway})}$$

. . . PROVIDING FOR "MAINTAINED ILLUMINATION"

The difference between maintained and initial illumination levels poses a problem: "How much initial illumination is required to maintain proper levels at all times?"

Three important factors must be considered: (1) the illumination value required for the particular projects; (2) lumen depreciation of the lamp; (3) depreciation of the optical system. Initial values should be calculated by using the desired illumination levels and *adding the depreciation factors.*

Westinghouse recognizes your problems in maintaining illumination levels over long periods of time. Providing larger luminaires, for cooler lamp operation and better lamp lumen maintenance, using heavier gauge material, for better mechanical construction and better reflection surfaces, is only part of our program to give you the best.

For practical engineering help in solving these problems, send for the new Street Lighting Engineering Handbook, B-5460 . . . or ask for reprints of this series of advertisements, Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. Consult with us at any time on any phase of a street lighting problem.

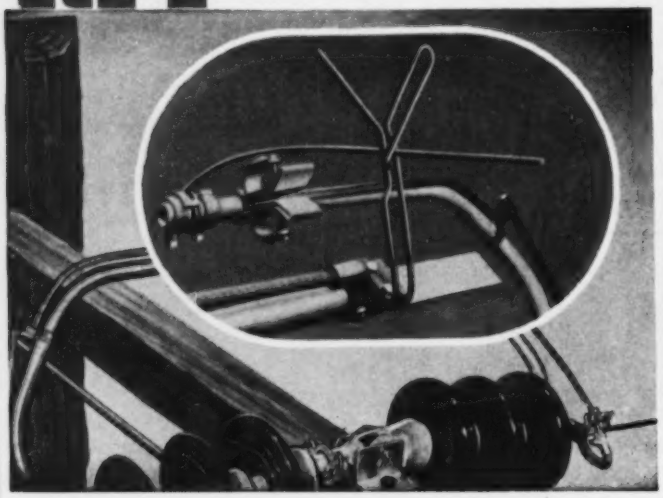
J-04509

Westinghouse OV-20, mercury-vapor luminaire, economically provides adequate illumination. Weatherproof and rugged . . . minimizes maintenance.

Westinghouse

LIGHTING DIVISION

KPF POLE TOP SWITCHES



Drop 40 miles of 69 kv lines with KPF Quick-Break pole top switch

Operating engineers tell us KPF switches with Quick-Break attachment are the most outstanding air-break switch improvement in 25 years. Before development of this Quick-Break device, pole top switching of 69 kv circuits was limited to some 6 miles of line. Now, operating experience shows that 40 miles of 69 kv line can safely be dropped with this equipment.

The secret of the KPF Quick-Break is a heavy-duty cat's whisker which whips free in a split second as the switch is opened. This mechanism prevents establishment of an arc; thus critical arc length is no problem.

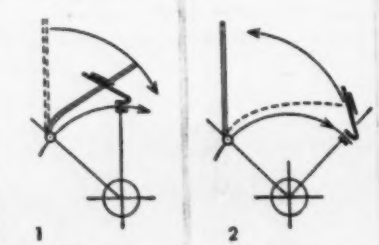
The KPF Quick-Break attachment is simply and ruggedly constructed for low cost, long life and all-weather dependability. It is available for all KPF switches rated 15 to 69 kv.

HERE'S HOW KPF QUICK-BREAK WORKS

1. Spring rod winds to full tension as switch opens.

2. Rod springs clear, breaking contact at high speed.

Write for details of KPF Quick-Break attachment and low cost, long-lasting, easy-to-install KPF Switches.

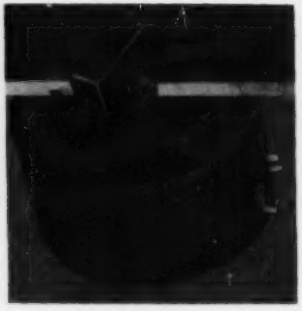


KPF ELECTRIC COMPANY
1624 E. Alpine Avenue • Stockton, California

Equipment

(*Continued from page* 198)

over 1,000,000 megohms per 10 sq in. of tape. It can be used either for mechanical or electrical purposes, will withstand 20 lb pull per inch of width and can be stretched to permit smooth wrapping. This new tape is said to adhere to any dry surface even at low temperatures, resist water, oils, chemicals and withstand weather extremes. **Okonite Co, Passaic, N. J.**



Transformer

A new variable voltage transformer, Powerstat Type 10, has been designed for 50, 100 and 150-w applications. It is rated 120v, 60 cycles, single-phase input with an output of 0-120/132v, 1.25 amp, 150/165 va.

The Type 10 features a smooth commutator surface, does not waste power in the form of heat, and will supply a continuously adjustable voltage to any load up to rated capacity. It is designed for single hole mounting. **Superior Electric Co., Bristol, Conn.**

200-Amp Welder

A light weight, compact engine-driven welder (Type EW-20) is avail-

(*Continued on page* 206)

IMPROVED THERMAL RESISTANCE WITH

VICTOR PURIFIED PORCELAIN

TRANSMISSION PINTYPES!

VICTOR NO. 245 TRANSMISSION PINTYPE

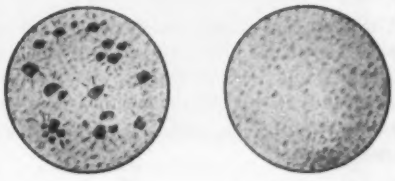
For complete engineering data on this insulator and other sizes and types, send today for Bulletin No. 4.

More Uniform Thermal Expansion Achieved

VICTOR *Purified* Porcelain has the most uniform thermal expansion ever achieved in the insulator field — expansion that remains uniform throughout its entire mass. This achievement, like *Purified* Porcelain's many other advantages, is due to the removal of all mineral salts from the water used in processing.

With VICTOR *Purified* Porcelain, failure of shells due to sudden thermal changes is eliminated. Choose VICTOR TRANSMISSION PINTYPES — made of *Purified* Porcelain — finest insulator porcelain ever made!

VICTOR INSULATORS, INC. VICTOR, N. Y.



Cross-Section of Ordinary Porcelain

Cross-Section of Purified Porcelain

Here's Why *Purified* Porcelain Has Uniform Expansion

The drawing at the left shows a greatly enlarged section of ordinary porcelain and reveals what ceramic authorities agree contributes to porcelain weakness and possible failure under unusual service conditions. The various irregular shapes are glass-like impurities which are formed during firing, by mineral salts in the processing water. After firing, these impurities shrink at a different rate than does the porcelain itself, causing tiny fissures (shown by the dark radiating lines) which physically weaken the insulator and make it more vulnerable to puncture. Also, these differing rates of thermal expansion set up dangerous strains and stresses during sudden temperature changes in service that can actually weaken the insulator.

The drawing at the right shows the homogeneous quality of *Purified* Porcelain. Its absence of impurities gives uniform thermal expansion and lessens the possibility of failure under extreme conditions. Other advantages: maximum density and hardness, higher mechanical impact values, improved range of M and E strength values and higher all puncture values!

Specify VICTOR TRANSMISSION PINTYPES

No.6 specify Hi-Voltage

★ *For those higher-voltage substations . . . 115 through 161 kv . . . the Hi-Voltage Equipment Co. offers a complete line of Gang-Operated Switches.*

Substations and switching stations seldom follow any particular pattern. That is why an Air-Break Disconnect Switch Installation must be designed to fit the particular structure.

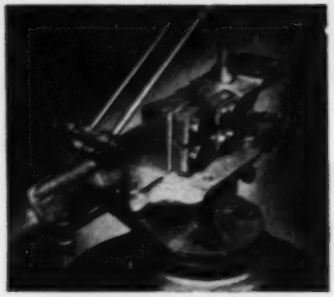
Consider that a switch installation consists not only of the switch itself, but also of an operating mechanism and bussing arrangement. The operating mechanism is standard only insofar as the individual parts are concerned . . . 1¾" cold-rolled galvanized hexagon steel shaft, clamp-type fittings, compression couplings, connections and bearings.

The three switch designs shown on the opposite page take care of practically all switch requirements for any station PROVIDED their bases are properly sized and drilled. The dimensions we show are purely typical. They vary for practically every installation.

That is why we ask you to tell us what you want . . . to send us your station drawing, showing the preferred location of operating handles. We will work out the operating mechanism and show all attachments and drilling required in the steel.

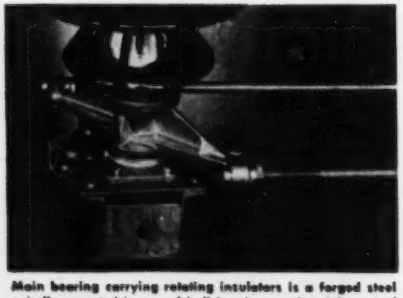
Working with us in this way will reduce your switch installation cost as much as 20 to 40% because all parts of the switch installation are completely machined and pre-fitted at the Factory. All parts are positively identified . . . keyed to easy-to-follow installation data. Field cutting and drilling are eliminated. The simplicity and ease of installation saves hours for the construction crew.

Ask your Joslyn Representative to show you the many money saving advantages of Hi-Voltage Switches.



Typical of all Hi-Voltage, Gang-Operated Disconnect Switches are these SILVER-NICKEL CONTACTS. They combine low resistance with low friction. Stainless steel springs maintain maximum conductivity.

Powerful, compact, completely enclosed mechanism controls the swinging motion and the end motion of the Type L-W switch arm. Every part is corrosion-proof. Monel and graphite insert bearings . . . stainless steel balance spring . . . bronze gears and cranks. Nothing to stick or bind, nothing to oil and nothing to adjust.



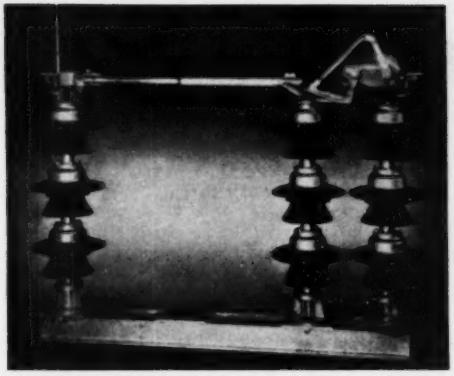
Main bearing carrying rotating insulators is a forged steel spindle mounted in monel ball bearings and stainless steel races. Never requires lubrication.

Hi-Voltage

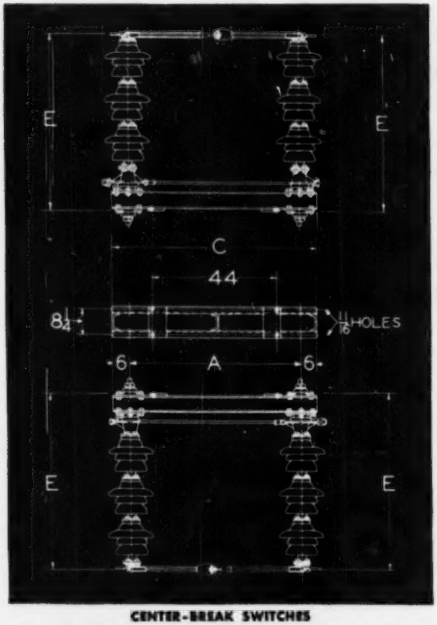
for high-voltage substations

Hi-Voltage SWITCHES ARE AVAILABLE

from 200 to 3000 Amperes, 7500 to 161,000 Volts for upright, underhung or vertical mounting.



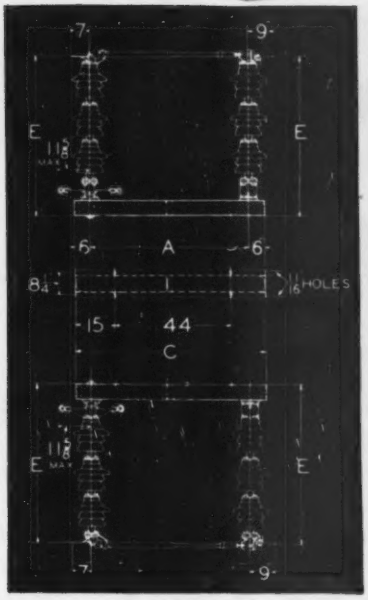
ROTATING-INSULATOR, VERTICAL-BREAK SWITCH . . . 115 and 161 kv . . . is available in two current ratings . . . 600 and 1200 amperes. Operating records of this switch under all climatic conditions, leaves little to be desired.



CENTER-BREAK SWITCHES

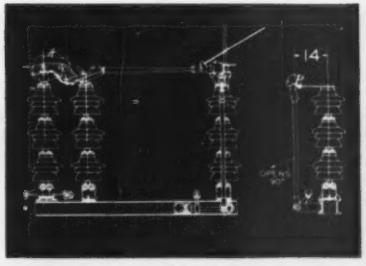
Principal applications are where phase spacing or ground clearances are limited.

Voltage	Ampere Capacity	Dimensions in Inches A	C	E	Standard Phase Spacing
115,000	600 1200	60	72	61	7′
161,000	600 1200	84	96	75½	9′



SIDE-OPENING SWITCHES

Voltage	Ampere Capacity	Dimensions in Inches A	C	E	Standard Phase Spacing
115,000	600 1200	60	72	58⅞	10′
161,000	600 1200	84	96	73⅛	14′



Type L-W Switch with Type N Grounding Switch

Grounding blade can be located on either side of switch base.

ALSO AVAILABLE!

Grounding Switches
Manual and Automatic Control Mechanisms
Mechanical Interlocks
Hi-Voltage Fuses
Cross-arms and Mounting Frames
And all customary accessories

EQUIPMENT COMPANY

4000 EAST 116th STREET • CLEVELAND 5, OHIO

GET
FAST INSTALLATION
COST-CUTTING ECONOMY
DEPENDABLE PROTECTION
with
BERMICO®
FIBRE CONDUIT

Bermico Fibre Conduit is easy to work and handle. Lightweight 8-foot lengths can be cut and tooled right in the field. Smooth inside bore assures quick "pull throughs" without chafing or abrasion.

Bermico Fibre Conduit holds down costs. Lays in a jiffy. Water-tight couplings go on fast—no sealing compound needed.

Bermico Fibre Conduit is engineered to withstand shocks and stresses of haulage—the heavy loads imposed during installation.

Complete line of bends plus angle couplings enable you to meet unusual field conditions.

Specify BERMICO—*for long service at low cost.*

Distributed by

WESTINGHOUSE
Electric Supply Company
Offices in principal cities

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SOLKA & CELLATE PULPS • SOLKA-FLOC • NIBROC PAPERS • NIBROC TOWELS • NIBROC KOWTOWLS • BERMICO SEWER PIPE, CONDUIT & CORES • ONCO INSOLES • CHEMICALS

Equipment

(*Continued from page* 202)

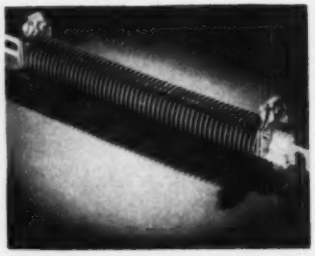
able with engine accessories and auxiliary apparatus that can supply 110-v 60-cycle, single-phase power from a conventional plug-in outlet. Its nominal rating is 200 amp 40v, 60% duty cycle with a current range from 40 to 250 amp. During off-welding periods, auxiliary power of 3kw at 100% power factor or 2 kva at 80% power factor are available for lights and power tools. About 300w are available for lights during welding periods.

The prime mover for this welder is a Ford "120", 4-cycle, 4-cylinder water-cooled industrial power unit. This engine drives the self-excited, compound-wound generator, which functions both as a dc generator, and as a single-phase alternator for auxiliary power.

Welding current is controlled in four ranges, by a tap switch and a shunt field rheostat. The ac power circuit includes conventional outlets, a voltmeter, and a breaker with overload protection.

For portability, this welder can be obtained equipped with two-wheel running gear.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.



High Current Resistor

A new edge-wound resistor designed for high current duty in both intermittent and continuous applications has been developed.

The new resistor is stated to offer high heat dissipation, resistance to oxidation and the ability to withstand shock and vibration without breaking or shorting.

The Power-Rib resistors are particularly applicable in electric trucks, battery chargers, motor controllers, etc. Resistors are available in resistance values from 0.1 to 2.85 ohms.

Ohmite Mfg Co, Chicago, Ill.

Another Westinghouse Relay Development

New CO Relay

The Type CO Overcurrent Relay is available in Flexitest or standard rectangular projection case.

has a "Two-in-One" Time Curve

One relay now gives you two time curves. Inverse and very inverse relays are identical except for calibration and may be changed from one curve to the other (or intermediate curve) simply by changing the calibration adjustment—a new high in protective relaying flexibility.

The CO Relay also offers superior performance in accuracy. Its new "E" element has four independent adjustments to assure accuracy over the entire operating range.

Flexibility, accuracy and reliability combine in the new CO Relay to represent the greatest advance in overcurrent relaying since Westinghouse developed the induction disc relay.

Ask your Westinghouse representative to show you the new CO Relay—he'll be glad to go over it feature by feature with you—or request a demonstration by writing to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40409

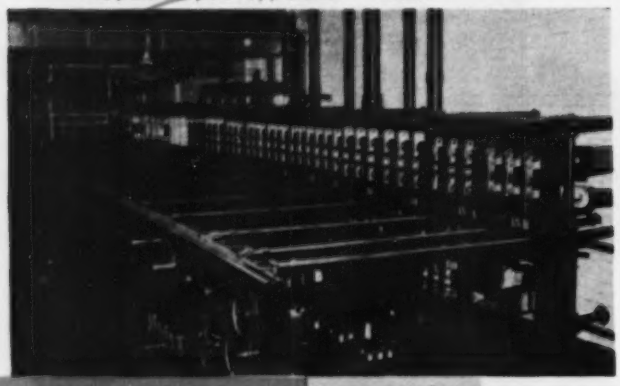
Westinghouse

RELAYS

Anticipate* Destruction

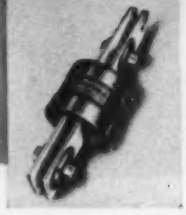
Amp-trap PREVENTS DEVELOPMENT OF HEAVY SHORT CIRCUIT CURRENTS

* To preclude or prevent by prior action — Webster



SHAWMUT Amp-trap*

"T. M. REG. U. S. PAT. OFFICE"



Amp-trap installation at Bird & Son, E. Walpole, Mass., raised the interrupting capacity of the system from 20,000 amperes to 100,000 amperes R.M.S. at 600 Volts, 60 Cycles.

NEW, LOW-COST SHORT CIRCUIT PROTECTION

Amp-trap, with its 100,000 RMS Interrupting Capacity, opens the circuit so fast that it *precludes* the development of the peak available short circuit current. Consequently, it *prevents* both magnetic and thermal destruction. Even phase-to-ground faults are cleared so quickly that multi-conductor faults are usually avoided.

CERTIFIED AND APPROVED

Amp-trap is listed by Underwriters Laboratories. Interrupting tests up to 202,000 amps at 500v 60 cycles have been witnessed and certified by Electrical Testing Laboratories, Inc. Amp-trap is favored by many insurance companies.

FOR SYSTEMS OLD OR NEW

Amp-trap is supplied in all standard ratings up to 4000 amperes for application on any circuit up to 600 volts AC or DC. It can be used on either old or new switchgear with a minimum of structural rearrangement. "Outage" time for installation is negligible. There is no better way to insure your investment in switchgear, bus-ducts, motor starters, circuit breakers and current transformers. Every service entrance on a network system needs Amp-trap protection. The list of Amp-trap users reads like the Blue Book of American industry. Investigate now.

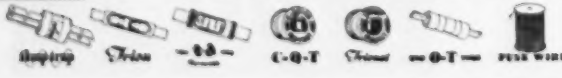
"You Can Get Amp-traps"

WRITE FOR FREE AMP-TRAP BULLETIN TODAY.

AMP-TRAPS — Always At The Switch

THE CHASE-SHAWMUT CO.

370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS



WHAT THEY'RE SAYING

At Industry Meetings

The Outlook for Aluminum

DAVID P REYNOLDS, vice president, domestic and foreign marketing, Reynolds Metals Co, before the National Association of Sheet Metal Distributors at Pittsburgh, Pa.

Aluminum has really become a truly basic metal since World War II and the industry is new in its bigness with the country's primary output jumping from 327 million lb in 1939 to 819 million lb in 1946.

Since then production has almost doubled and will almost double again by 1953, when the output rate will be over 3 million lb a year.

With the U. S. market growing, it is very important to keep in mind that the future aluminum market does not depend on the extermination of other markets. The price of aluminum is still basically below the 1939 price. No other metal can match this price record. Not only have prices been kept down but production has been boosted skyward. Whereas steel production has just about doubled since 1939, aluminum production is more than five times as great as at that time.

The outlook is very good but this optimism must not be misunderstood. It does not mean that we can take markets for granted. We have the opportunity to develop markets, not guarantee them. It does mean that a tremendous selling job is ahead for distributors, fabricators and producers.

Free Enterprise Endangered

ALLAN D MARSHALL, General Electric Co, before the insurance luncheon at the National Chamber of Commerce meeting at Washington, D. C.

The American system of free enterprise is endangered not only by government interference with business on the domestic scene, but also by a severe threat of socialism from a little known treaty organization. This group, called the International Labor Organization, formed in 1919 as part of the League of Nations, is attempting to enact social legislation on an international treaty basis. The United States is a member of this International Labor Organization.

According to our Constitution, "the

(*Continued on page* 213)

Easier to Install

P-L ANCHORS

Blades are properly shaped to glide smoothly and easily into solid, undisturbed earth with just a few blows of the tamping bar . . . Heavy-gauge, high-strength steel used throughout. Deeply embossed and ribbed blades withstand heavy loads without buckling . . . Correctly aligned with grain of steel to prevent tearing and breaking—an absolute necessity for anchor strength.

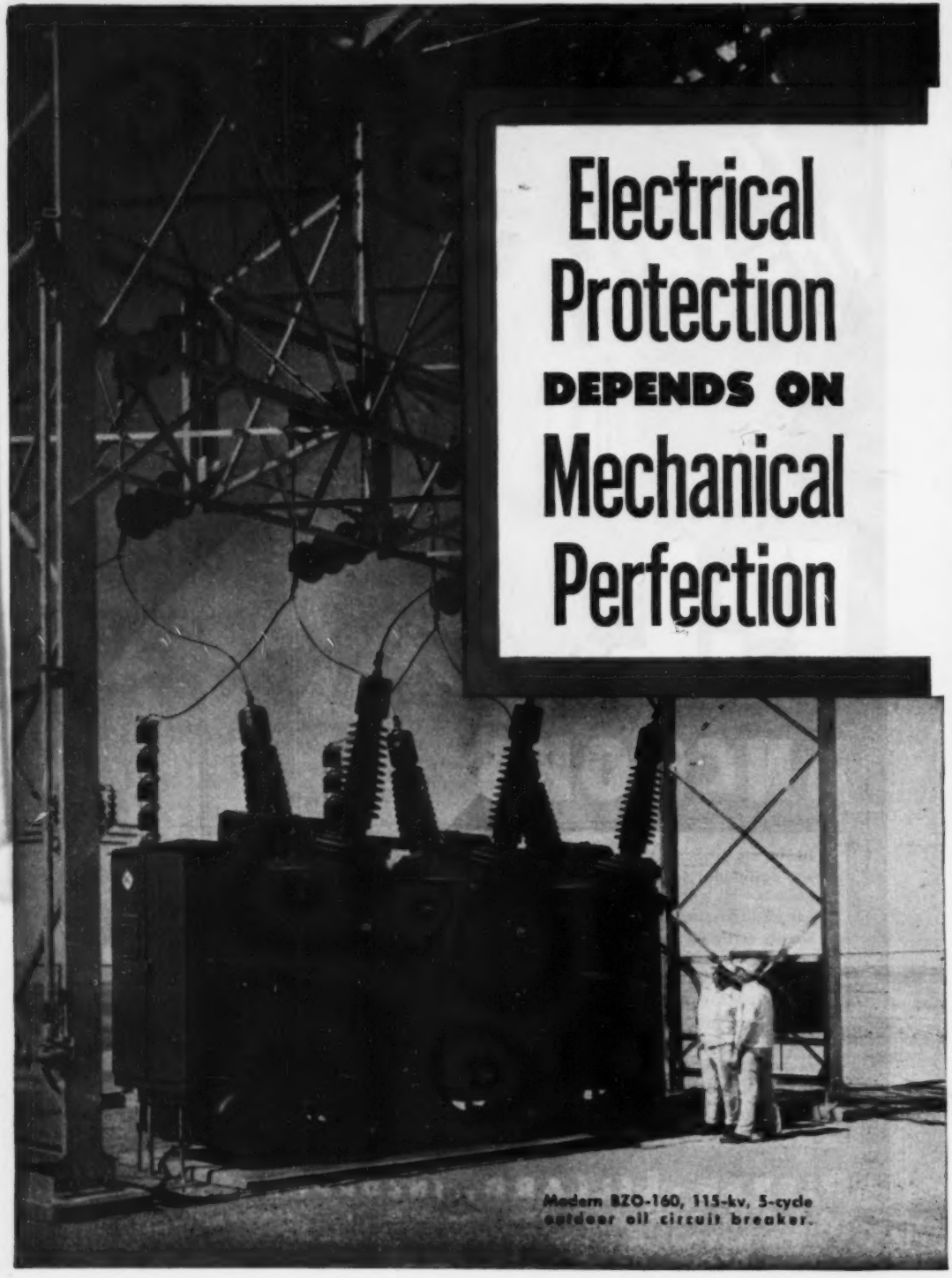
Above type available in 8" diameter with 100, 115 and 135 square inch expanded area. Other types and sizes also available. PL-52-8

WRITE FOR DESCRIPTIVE LITERATURE

PIEPER-LILLARD, INCORPORATED

TELEPHONE TERRYHILL 3-2575 • 122 N. KIRKWOOD RD. • ST. LOUIS 22, MO.

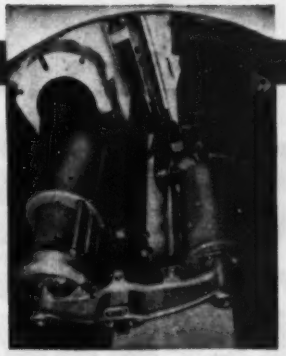
ORIGINATORS OF THE BENDING HINGE ANCHOR



Modern BZO-160, 115-kv, 5-cycle outdoor oil circuit breaker.

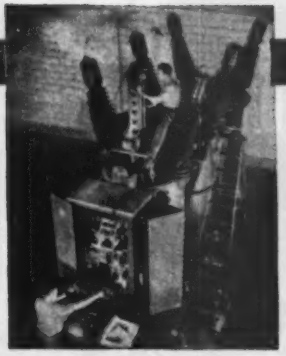
Time-Proved Mechanically Trip-Free Pneumatic Operator

Electrical protection depends on *fast breaker operation under all conditions.* Only mechanically trip-free operation assures this because breaker contacts open independently of the operating mechanism. And such operation provides fast recoupling for immediate reclosing.



Time-Proved *Turbo-Ruptor* and *Turbo-Jet* Interrupting Devices

Electrical protection depends on *fast circuit interruption.* A-C low arc energy devices employ directed oil turbulence for swift arc extinction; self-cleaning, low resistance contacts assure low operating temperature. The result is minimum contact and oil deterioration.



Time-Proved Electrical and Mechanical Pre-Shipment Testing

Electrical protection depends on *unfailing, coordinated operation.* A-C breakers are designed to provide that operation and are thoroughly tested to assure it. Before shipment, electrical and mechanical operation is verified by rigid checks and special test equipment.

Turbo-Ruptor and Turbo-Jet are Allis-Chalmers trademarks.

Type BZO OIL CIRCUIT BREAKERS

Details Contribute to Dependability

Double-hinged, gasketed mechanism housing doors . . . white enameled tank interiors . . . large, hinged tank manhole covers — these and many other details provide easy accessibility for inspection and contribute to the over-all reliability of Allis-Chalmers circuit breakers.

RATINGS

From 69 to 230 kv . . . 1,500,000 to 10,000,000-kva interrupting capacity . . . 5 and 3-cycle interrupting times . . . repetitive reclosing service to meet the industry's fastest requirements.

For more information about these Type BZO oil circuit breakers, ask your nearby A-C representative for Bulletin 71B6022, or write to Allis-Chalmers, Milwaukee 1, Wis.

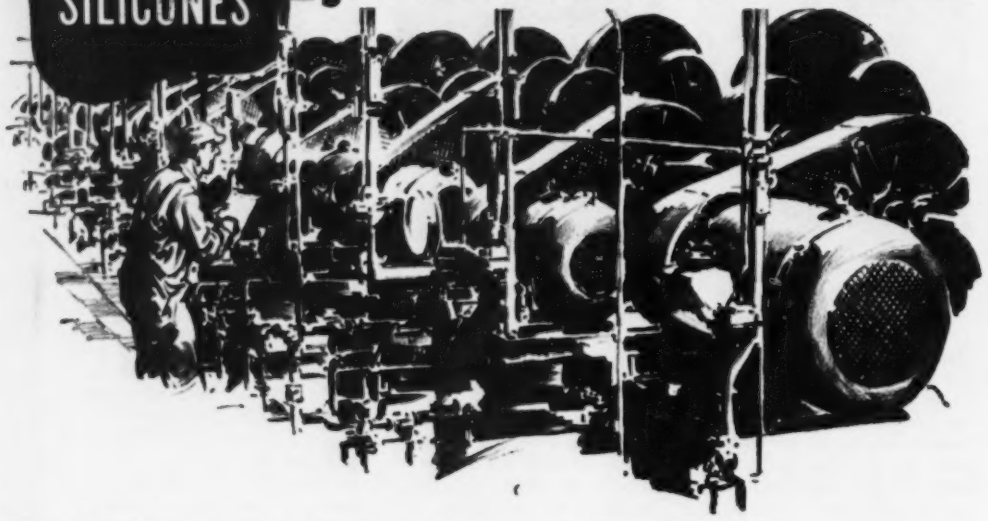
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-3743

DOW CORNING
SILICONES

give motors more muscles



Gained 30% more pumping capacity; saved about $50,000

Engineers of a leading chemical company had to increase pumping capacity in one production unit by 30%. They did so by having 31 motors with name plate ratings of 50 and 60 hp at 850 rpm, rewound with Class H insulation to put out 75 to 90 hp at 1150 rpm.

New 75 hp motors with conventional insulation plus installation would have cost $68,200. Rewinding, plus installation on the original mounts, cost about $19,000. That's an initial saving of almost $50,000.

Equally important has been the added life and reliability of these Class H motors. The old 50 and 60 hp motors burned out at the rate of one a month or 48 failures in 4 years. Rewound with Class H insulation, these same motors have been delivering at least 50% more power for the past 4 years with only 6 failures.

That's why more and more engineers and management men specify Class H insulation for hard working motors, for critical motors that determine productive capacity, and for motors subjected to high ambient temperatures and excessive moisture or corrosive chemicals.

It has been proved over and over again that Class H insulation made with Dow Corning Silicones has 10 to 100 times the life expectancy of the next best class of insulating materials; can be used to increase the power per pound ratio in electric machines by as much as 50%.

mail this coupon today

Dow Corning Corp., Dept AY-19 Midland, Mich.
Please send me:
- ☐ Catalog of Class H Insulating Materials.
- ☐ List of Class H motor repair shops.
- ☐ Data on Silicone Grease for motor bearings.
- ☐ 32-page booklet entitled "What's A Silicone?"

Name _____
Company _____
Street _____
City _____ Zone ____ State _____

You can also reduce or eliminate motor outages due to bearing failure; specify Dow Corning 44 Silicone Grease for motor bearings.

In open and single shielded bearings designed for high temperature operation, Dow Corning 44 has 8 to 10 times the life expectancy of conventional greases. It gives life-time lubrication in permanently sealed bearings.

DOW CORNING SILICONES

DOW CORNING CORPORATION
Midland Michigan

Atlanta • Chicago • Cleveland • Dallas • New York • Los Angeles • Washington, D. C.
In Canada: Fiberglas Canada Ltd., Toronto • In England: Midland Silicones Ltd., London

ratification of a treaty by the Senate shall be the law of the land . . . anything in the Constitution or law of any state to the contrary notwithstanding." The ILO membership includes countries that now have systems of state socialism who are obviously in support of state controlled systems whether in Social Security or in industrial organizations.

Under these circumstances any social legislation enacted on an international basis would automatically become the law of the land superseding any state or federal law. An international agreement of this sort certainly presents a serious threat to free enterprise in this country.

Where Do We Go From Here?

H J KLINGLER, vice president, General Motors Corp, before the 44th Annual Automobile Merchants Association of New York at New York.

Profit making is a management function, not an economic circumstance and the operating results are good or bad depending upon the owner or manager. To amplify this statement may I suggest that all automobile dealers should seriously consider three basic phases of their management policy.

Sales management has for many years been "pull" selling. The desirability of our products forced the customers to come to us. From now on it looks as if we will have to use "push" selling in order to maintain our sales volume. This means building up the number of salesmen and thoroughly training them in modern merchandising. During the recent high profit period in the retail end of the business the dealer did not have to be an efficient financial manager to be successful. It now appears that the dealers and managers will have to watch every item for which they pay money and increase their expenses. Last but not least of the three phases is customer relations. Because this business is so intimately associated with the home, the family and practically every aspect of community life it is essential that the relation between dealer and customer be developed.

As for the future designs, I doubt if the next year will bring three-wheel cars or automobiles adapted to land, sea and air, but I do forsee that within a short time air conditioning will be available for the added comfort of the car owner.

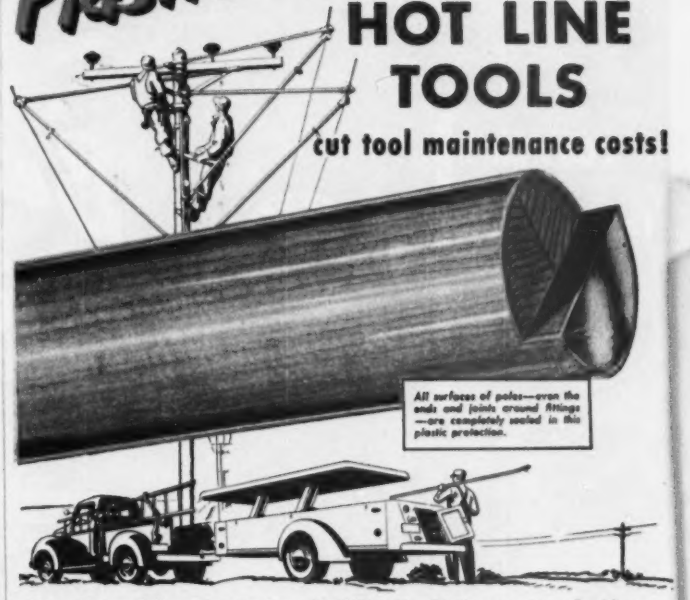
CHANCE

MAPLAC*

Plastic Protected

HOT LINE TOOLS

cut tool maintenance costs!



Now, Chance lightweight, aluminum-fitted Hot Line Tools are protected with a new super-tough plastic finish called "Maplac"* that greatly reduces tool maintenance and helps to keep tools in safe working condition.

This new plastic protection has many plus features of real value to hot stick users:

TOUGHNESS to withstand any impact or abrasive action encountered in normal use.

TRANSPARENCY that permits initial inspection and periodic checks.

MECHANICAL STRENGTH–Chance "Maplac," being extremely tough, does not require sacrifice of pole size and strength to gain the necessary thickness. It adheres to the wood surface and reinforces the pole adding to the factor of safety.

TEMPERATURE RESISTANCE–retains its toughness under widely varying temperatures.

ELECTRICAL RESISTIVITY– exceeds the voltage withstand tests of the wood insulation (complete safety, however, depends on the moisture content of the wood–no plastic will completely prevent absorption of moisture vapor).

MOISTURE RESISTANCE–Chance "Maplac" retards the absorption of atmospheric vapor in high humidity and protects the wood from precipitation moisture (this does not mean that plastic covered poles are recommended for use in the rain–but that Chance "Maplac" greatly reduces moisture penetration.

REPAIRABILITY–may be repaired without heat or special tools if cut by a sharp blow.

All this at NO INCREASE IN PRICE! Specify Chance "Maplac" Plastic Protected Tools.

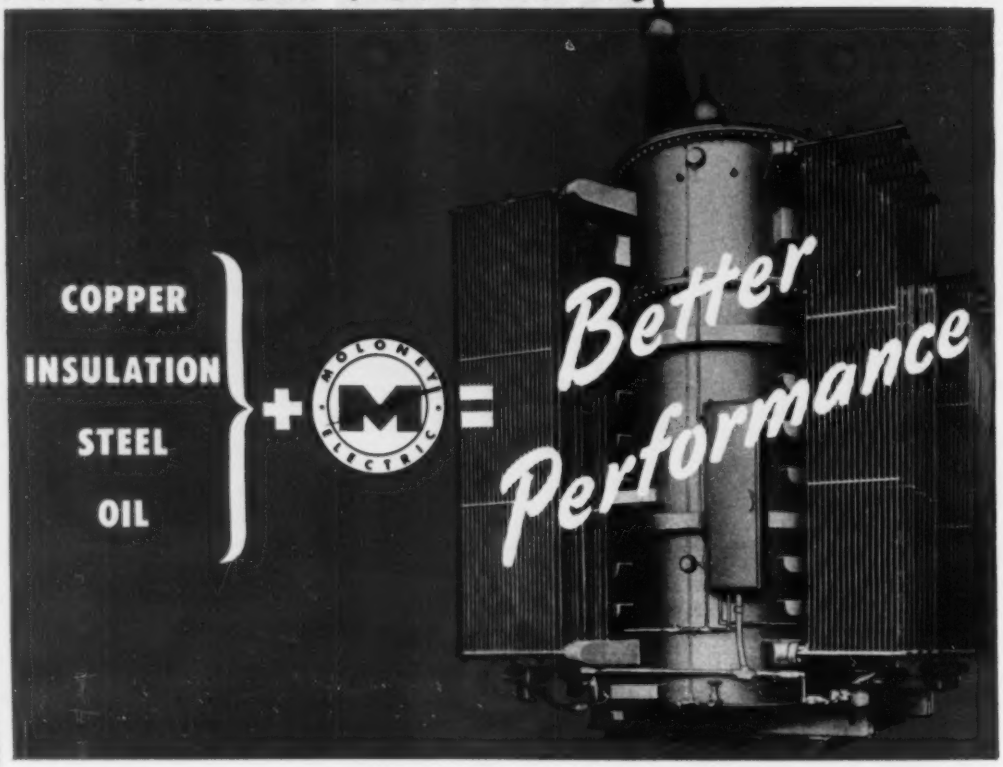
*TRADE NAME

A·B·CHANCE CO·

CENTRALIA, MISSOURI

SAN FRANCISCO, CALIF.

A Proven Formula!



ALTHOUGH the same basic materials—copper, insulation, steel and oil—are used in the construction of any power transformer, the intangible "know how" is the most important factor contributing to its quality of performance. Moloney has acquired this knowledge and skill through experience in the manufacture of transformers exclusively since 1896. Engineering and manufacturing facilities are supplemented by a complete test department which includes a 3,500,000 volt surge generator. Operating records prove that you can expect *better* performance, *less* maintenance cost and *greater* reliability from Moloney Transformers.

M-E51-10

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

MOLONEY ELECTRIC = { BETTER PERFORMANCE / GREATER RELIABILITY / LESS MAINTENANCE

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

NEWS ABOUT PEOPLE

Lasseter Is Appointed a VP

Savannah (Ga.) Electric & Power Co promotes former general superintendent to the executive post

Kenneth C. Lasseter, general superintendent of Savannah (Ga.) Electric & Power Co, has been elected vice president in charge of operations of the utility.

Lasseter has been associated with the utility since 1923, except for the period between 1930 and 1937 when he was connected with the Western Public Service Co with headquarters at Scottsbluff, Neb. He started as a junior engineer and was advanced to superintendent of transmission and distribution. He was appointed general superintendent of Savannah E&P in 1950.

Before joining Savannah E&P, he worked for a short period with Stone & Webster, Inc, Boston, and later was affiliated with the Lowell (Mass.) Electric Co.

K. C. LASSETER

Other officers of the company re-elected were L. C. McClurkin, president; W. C. MacInnes, New York, vice president; and J. J. Miller, secretary and treasurer.

Con Edison Reveals Changes

Consolidated Edison Co of New York, Inc, has made assignment changes for several of its department heads.

M. LeCompte Waring has been assigned to Westchester County operations which are under the direction of Vice Pres L. A. Scofield. He was formerly assistant vice president with Earl L. Griffith, vice president in charge of construction.

Walter B. Fisk, Jr, formerly planning engineer, has been made system engineer succeeding R. Frank Brower, newly elected assistant vice president (EW, June 16 p 231). Fisk's post will be filled by Theodore D. Reimers, Jr, who has been assistant inside plant engineer.

Harry C. Otten, general superintendent of Westchester County's operations department since 1946, has been named manager of the system operations department. He succeeds Otto W. Manz, Jr, newly appointed assistant vice president (EW, June 16 p 231). Otten will be replaced by Donald S. Kennedy, assistant general superintendent.

E. C. M. Stahl, manager of the distribution operation department since 1946, has been appointed assistant to Vice Pres A. H. Kehoe who is temporarily in charge of production and operation.

Stahl's former post has been filled by Frederick C. Shaughnessy, who has been manager of the outside plant construction department since 1949. J. Eliot McCormack, chief distribution engineer since 1949, has been placed in charge of the outside plant construction department.

Heads Association

Charles R. Landrigan, comptroller of Detroit Edison Co, has been elected president of Michigan Electric Association. J. H. Campbell, vice president, Consumers Power Co, and J. H. Warden, president and general manager of Upper Peninsula Power Co, were elected vice presidents. Landrigan, who has been associated with the utility since 1912, was named to his present post in 1949.

Merit Award Given to 9 Westinghouse Employees

Nine executives and engineers of Westinghouse Electric Corp have been awarded the Westinghouse Order of Merit, highest company award for distinguished service.

Pres Gwilym A. Price presented the awards on behalf of the company's board of directors at an informal luncheon held recently at the Wall Street Club, New York.

The recipients are: Fred R. Davis, manufacturing equipment design engineer, Small Motor Division; Frank W. Godsey, Jr, manager of the Electronics, X-Ray, and Air-Arm Divisions; Robert L. Jeans, manager, Projects Division, Westinghouse Electric International Co; Lee A. Kilgore, assistant manager of alternating current generator engineering, Transportation and Generator Division; John D. Miner, Jr, manager of aviation engineering, Small Motor Division; Otis Rae, Southeastern district manager; John B. Seastone, manager, materials engineering; Philip C. Smith, assistant to manager, Transportation and Generator Division; and Carroll E. Valentine, manager, design section, generator voltage regulators.

•

Dr Everard M. Williams has been named head of the department of electrical engineering at Carnegie Institute of Technology. Williams, who has been a member of the faculty since 1945, replaces **Dr B. Richard Teare** who was recently made associate dean of Carnegie's College of Engineering.

Orrie Van Rye, formerly personnel director of New England Electric System, Boston, has been appointed assistant vice president of Worcester County Electric Co, a NEES subsidiary. Van Rye, who will make his headquarters at Milford, will have charge of company activities in the Marlborough, Milford, Franklin, and Uxbridge areas in Massachusetts.

Les M. Taylor, vice president and general sales manager of Mississippi Power & Light Co, in addition to his other duties, has assumed responsibility for directing an expanded Agricultural and Industrial Development Department and a newly created Pub-

FITS EVERY LINEMAN!

NEW

Buckingham Adjustable Climbers

Now—one pair of climbers that fits tall men, short men —all men on the crew! One pair of climbers that accommodates the various thicknesses of footgear and clothing worn in different seasons!

New Buckingham Adjustable Climbers are quickly and easily adjusted from size 15" to size 18" by means of an oval head set screw and lock washer, assuring exact fit. If desired, leg irons can still be bent to follow the shape of the wearer's leg.

These advanced-design climbers permit utilities to carry a smaller stock of climbers. They are eminently practical as extra climbers. And—because they will fit any worker—they're ideal for sub-station, plant or service truck.

Famous Buckingham Quality, Safety, Comfort

Buckingham Adjustable Climbers can readily be fitted with leg and foot straps, and deluxe leather pads filled with rubberized wool for greater comfort. Gaffs are permanently attached to the leg irons, pitched at an angle which permits closer standing to the work—less chance of cut-out—easier climbing.

Standardize on Buckingham Adjustables. Fewer pairs are needed to keep every man working.

Ask about them at your supply house — or write for further information.

BUCKINGHAM MANUFACTURING CO., INC.
1-3 TRAVIS AVENUE BINGHAMTON, N. Y.

lic Information and Advertising Department. **L. O. Bradshaw** was made manager of the expanded development department and **Herbert Shaddix** is the manager of the new information and advertising department.

E. E. Bauer has been named manager of power transformer apparatus sales for General Electric Co. In his new post Bauer will be responsible for the promotion and sales of high-voltage testing equipment, bushings, and components for electronic applications, rectifier transformers, furnace transformers, and current limit reactors.

Utilities Library Group Elects Green Chairman

Richard D. Green, librarian of the National Association of Electric Companies, Washington, D. C., has been elected chairman of the Public Utilities Librarians Section of the Special Libraries Association. He succeeds Miss Irene Marten, Union Electric Co of Missouri.

Other officers elected were Miss Mary E. Agee, American Gas Association, vice chairman; and Miss Marie E. Bozenhard, Hartford Electric Light Co, secretary.

The Public Utilities Librarians group is comprised of 67 librarians of electric, gas, and telephone companies and industry associations in the United States and Canada.

•

Alfred M. Hunt, assistant secretary of the Aluminum Co of America since 1950, has been elected secretary. Hunt, who came to Alcoa in 1942, succeeds **J. R. D. Huston** as secretary, a position he has held for the past eight years. Huston joined Alcoa in 1918.

Robert J. Kelley has been elected treasurer of Central Illinois Light Co succeeding the late T. V. Griffith (EW, June 16, p 236). The utility also named **John Miller** assistant secretary.

Elmer Lindseth, president, Cleveland Electric Illuminating Co, was elected to the board of directors of the American Management Association for the 1952-1955 term at the association's annual meeting held recently in New York. **Don G. Mitchell,** president, Sylvania Electric Products, Inc, was elected chairman of the executive com-

NOW! Do your construction fastening up to 100 times faster with

NEW CARTRIDGE-POWERED MODEL 450

REMINGTON STUD DRIVER

. . . and do it safely!

This revolutionary tool attaches steel or wood structural pieces to concrete or steel surfaces in seconds . . . cuts costs and working time on construction jobs. Completely self-powered, the Stud Driver sets as high as 5 studs per minute . . . with no outside power source or other equipment required. Studs have pull-out resistance as high as two tons!

Test-proved to be the world's finest and speediest fastening system, the Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., *America's oldest and foremost sporting arms manufacturer*. Price for Model 450, complete in rugged steel carrying case—only $119.50. To obtain detailed information on this time and money-saving tool, and for the name of your nearest distributor, fill out and mail the coupon below.

It's fast, easy and safe to operate the Remington Stud Driver

Speeds all these jobs . . . and many more!

1. Attaching conduit and panel boxes to steel, concrete or brick.
2. Anchoring fluorescent and other lighting fixtures in concrete.
3. Radio and television fastening.
4. Fastening conduit clips to concrete or steel.
5. Fastening eye bolt in concrete for stringing wires.

Simply hand-assemble stud and power cartridge, load as a unit in easy-to-open Remington Stud Driver, and close.

Press loaded Stud Driver firmly against surface, depress safety lever and pull trigger. Explosive charge imbeds stud solidly.

"If It's Remington—It's Right!"

Remington DU PONT

Remington Arms Company, Inc.
Industrial Sales Division, Dept. EW-7
939 Barnum Ave., Bridgeport 2, Connecticut

I am interested in obtaining detailed information on the Model 450 Remington Stud Driver.

*Name*_____

*Firm*_____

*Position*_____

*Address*_____

*City*_____ *State*_____

No Use
Getting Up, Pal,
You Have No Place to Work This Morning!

While you slept, the plant where you worked burned down! It happens—somewhere—almost *every* night. And it happens because Management neglected to provide adequate fire protection, even though they *thought* they had done so!

Fires break out whether you are ready for them or not. All too frequently these fires, with the speed of lightning, hit vital points—generators, transformers, switching equipment and other electrical devices. Production is quickly knocked out. Machines are destroyed, records lost, buildings leveled—and manpower crippled.

Thinking plants are safe isn't enough. It's essential to *know!* A CARDOX survey will show how CARDOX "Low Pressure Carbon Dioxide Systems*" will guard the danger spots, do away with fire extinguishment losses—provide all-around, over-all fire protection. For full particulars, merely tell us who and where to address you.

*Covered by Patents Issued and Pending

CARDOX
ORIGINATOR OF **Low Pressure CO_2**
FIRE EXTINGUISHING SYSTEMS
CARDOX CORPORATION • BELL BUILDING • CHICAGO 1, ILLINOIS

mittee and **Hoyt P. Steele,** vice president, Benjamin Electric Manufacturing Co, was elected a divisional vice president for a second one-year term.

Joseph S. Parry, Jr, has been named assistant manager of Westinghouse Electric Corp's Apparatus Division. Parry, who joined Westinghouse in 1920, has been industrial manager of the company's Eastern district with headquarters at New York. His new offices will be at East Pittsburgh, Pa.

Loftin Johnson has been named superintendent of division operations for Florida Power & Light Co's statewide operations.

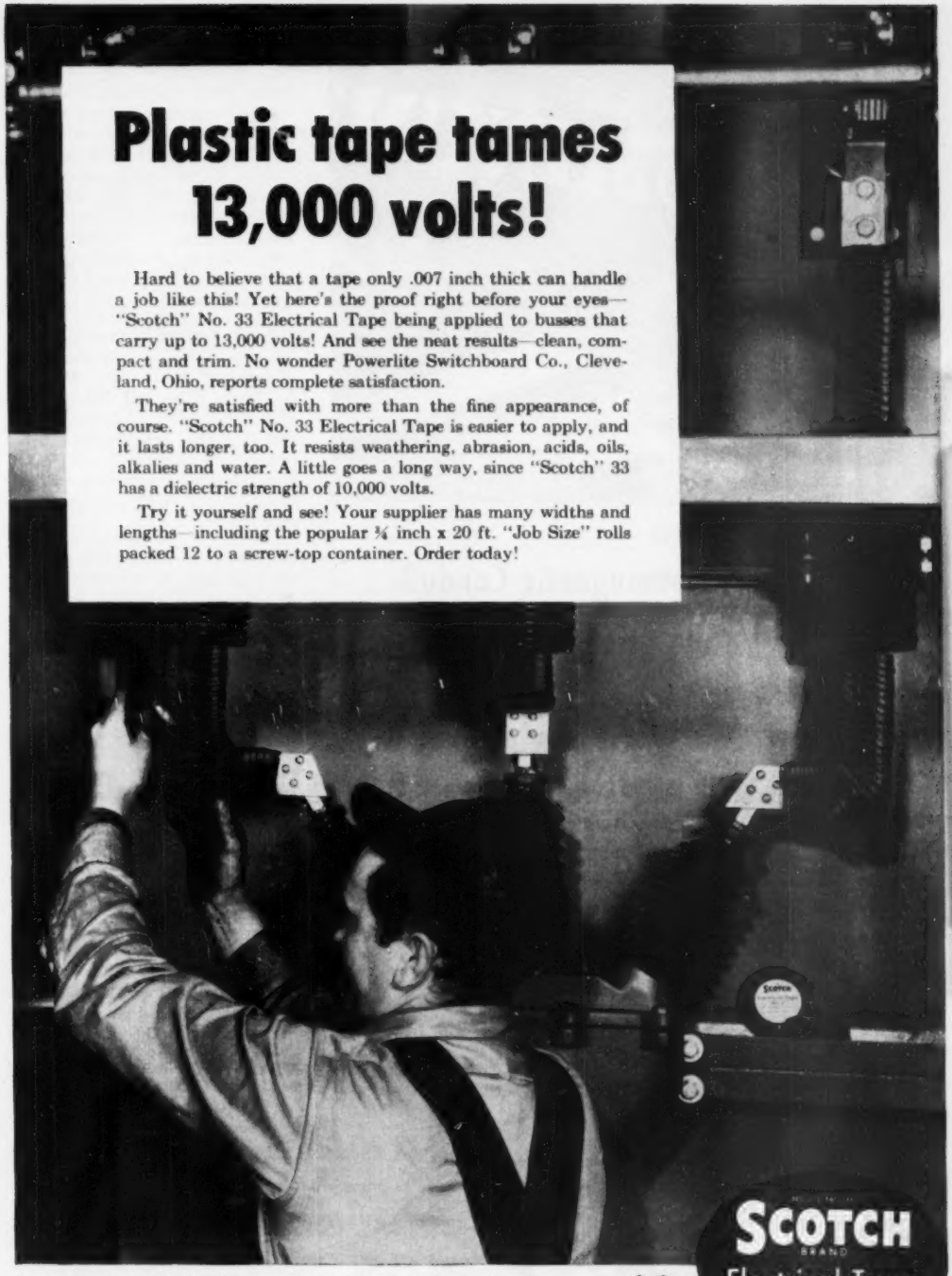
John Anderson, assistant secretary of General Electric Co, retired recently after almost 42 years' service. Closely connected with the company's apparatus sales organization throughout his career, Anderson assumed the secretarial post about seven years ago.

Robert W. Suman, who has been chief engineer for Link-Belt Co's Philadelphia plant for the past year, has been appointed chief engineer for L-B's new Colmar, Pa., plant, which is scheduled to begin operations later this year. **Norman Virkler** succeeds Suman at the Philadelphia plant. Suman joined L-B in 1934. Virkler started with the company in 1917 and has been in charge of all enclosed drive development work since 1946.

Carl T. Bannwert has been placed in charge of distributor sales for Magnatran, Inc, Kearny, N. J., manufacturer of heavy duty transformers. Bannwert was formerly with Kolton Electric Manufacturing Co, Weston Electric Instrument Corp, and Bluefield Electrical Supply Co.

George Norman has been appointed sales manager of Corning Glass Works' New Products Division. Norman comes to Corning from Aerovox Corp, New Bedford, Mass., where he served as chief engineer for that company's Mica Division for the past seven years.

George Gilliam and **C. J. Smolinske** have been appointed to industry sales managers posts in the Industrial Division of Minneapolis-Honeywell Regulator Co. Gilliam will be in charge of sales of the firm's products for all types of engines and test facilities. Smolinske has been made industry sales manager for pyrometer supplies,



Plastic tape tames 13,000 volts!

Hard to believe that a tape only .007 inch thick can handle a job like this! Yet here's the proof right before your eyes—"Scotch" No. 33 Electrical Tape being applied to busses that carry up to 13,000 volts! And see the neat results—clean, compact and trim. No wonder Powerlite Switchboard Co., Cleveland, Ohio, reports complete satisfaction.

They're satisfied with more than the fine appearance, of course. "Scotch" No. 33 Electrical Tape is easier to apply, and it lasts longer, too. It resists weathering, abrasion, acids, oils, alkalies and water. A little goes a long way, since "Scotch" 33 has a dielectric strength of 10,000 volts.

Try it yourself and see! Your supplier has many widths and lengths—including the popular ¾ inch x 20 ft. "Job Size" rolls packed 12 to a screw-top container. Order today!

SCOTCH BRAND
Electrical Tape
No. 33

The term "Scotch" and the plaid design are registered trademarks for the more than 200 pressure-sensitive adhesive tapes made in U.S.A. by **Minnesota Mining & Mfg. Co., St. Paul 6, Minn.**—also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N. Y. In Canada: London, Ont., Can.

3M

Now, Nonmagnetic Conduit at ¼ the price you'd expect

Alcoa Aluminum Rigid Conduit sells for about 75 per cent less than other nonmagnetic conduit. Because of its nonmagnetic properties, Alcoa Conduit permits each conductor of a single or polyphase system to be separately enclosed, regardless of electrical load. It simplifies installation of equipment having widely spaced terminals . . . eliminates overcrowding terminal enclosures.

Alcoa Conduit is ⅔ lighter than steel conduit of equal size and length. Actual construction records show savings due to easier handling and fabricating. Alcoa Conduit resists corrosion by most industrial atmospheres . . . will not stain adjacent surfaces with rust.

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For complete information write for Alcoa's new booklet, *Alcoa Aluminum Electrical Rigid Conduit.*

ALCOA
ALUMINUM RIGID CONDUIT

a post formerly held by Gilliam. They will make their headquarters at Philadelphia.

Joseph Talla, who retired recently as electrical engineer and chief operator at the Bureau of Reclamation's Parker Dam, Calif., has been awarded the Interior Department's commendable service award. Talla won the award for the efficient operation and electrical maintenance of the Parker Dam power plant and switchyard since December, 1942. He was with the bureau about 30 years.

Robert A. Penfield has been appointed advertising manager of the Radio and Television Picture Tube Division, Electronics, Parts, and Tungsten and Chemical Divisions of Sylvania Electric Products, Inc. Penfield, who started with Sylvania in 1947, has been advertising supervisor of the firm's Tube Division at New York since 1951.

Lois Slade, who has been serving in the advertising department of Interstate Power Co, has been promoted to editor of the utility's publication "Interstate Power News." Miss Slade joined the company in 1947.

OBITUARY

Thomas C. Pearce, 59, general superintendent of the electric system for Potomac Electric Power Co since 1951, died June 30 at Bethesda, Md. Before assuming the electric system post, he had served as superintendent of the utility's substation department. He joined Pepco in 1920.

Cecil C. Willis, 53, superintendent of generation for Oklahoma Gas & Electric Co since 1941, died at Oklahoma City June 27. He had been associated with the utility for 30 years.

Harry E. Brandon, 69, engineer with the Hydro-Electric Power Commission of Ontario for 31 years, died June 11 at Toronto, Ont.

Laverty Steele, 62, district manager of the Eastern Shore Public Service Co of Maryland, died June 25 at Denton, Md. He joined the utility in 1922.

Maurice H. Logan, 78, retired supervisor of Public Service Electric & Gas Co's power stations, died at Jersey City, N. J., June 26. He retired in 1944.

10 years of operating experience

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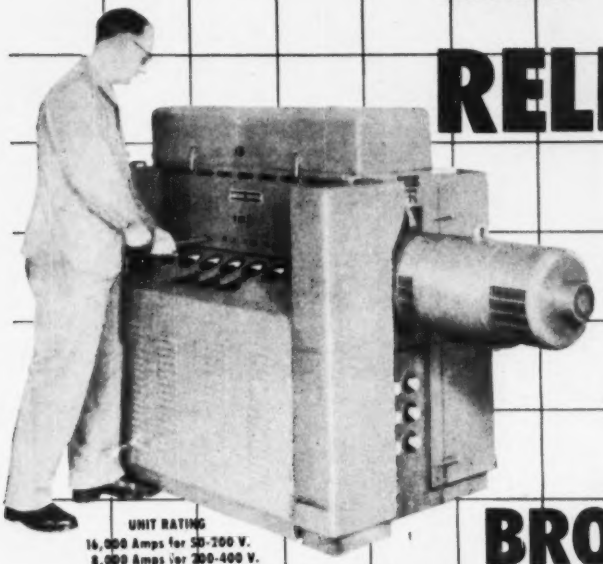

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8,000 Amps for 200-400 V.

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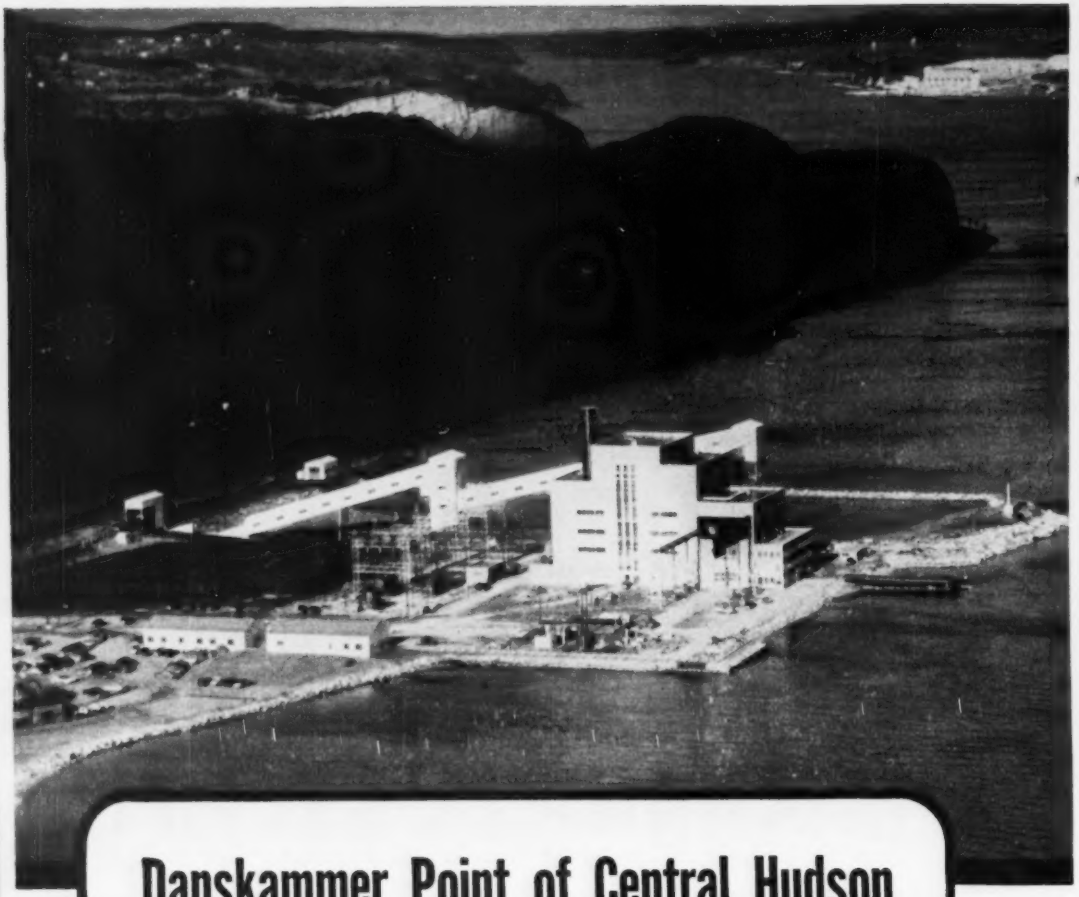

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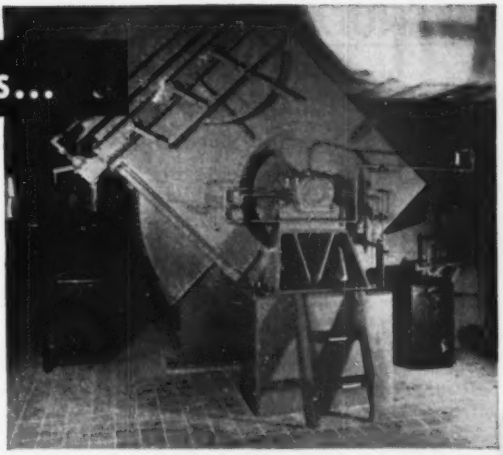
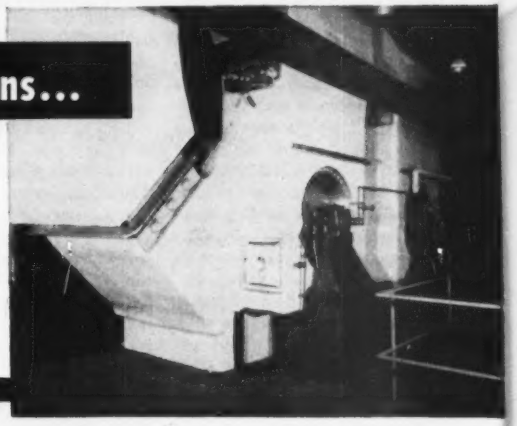
Two Green Forced Draft Fans...

operating in parallel on one boiler; each is designed to deliver 75,000 cfm of air at 125°F against 12.5 inches static pressure while running at 1175 rpm; special control type inlet dampers; standard control type outlet dampers; constant speed motor.



Two Green Induced Draft Fans...

operating in parallel on the same boiler as the F.D. Fans, each is designed to handle 126,000 cfm of gas at 335°F against 17 inches static pressure while running at 850 rpm; shut-off dampers at inlet and outlet; gyrol fluid drive.



Danskammer Point Station of Central Hudson Gas & Electric Corporation, has the reputation of being one of the most efficient plants in the country, with a fuel record of less than 8/10 pounds of coal per kw. These four Green Fans, because of their design efficiency and careful construction, are playing an important part in this production record. And the service they are giving is being duplicated in many utility and industrial steam generating plants throughout the country. In keeping with the requirements of dependable service, such plants "Go on Green" fans.

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Copper, Brass Outlook Bright

OPS permits wire and brass firms to increase prices of goods. NPA boosts red metal quota for July

The muddled copper and brass market is beginning to clear up. This was made evident by the recent action taken by the Office of Price Stabilization and the National Production Authority.

OPS Acts . . . The OPS amendment to ceiling price regulations dated June 30 permits makers of copper wire, brass mill copper products and copper alloy goods to raise prices to reflect the higher cost of imported copper.

NPA has authorized domestic users to purchase a total of 133,333 tons of domestic and foreign and refined copper concentrates and scrap. This represents an increase over the average of 101,363 tons a month users have been allowed during the second quarter.

OPS has based its increased ceilings on the 36½¢ a lb for foreign metal against a former price of 27½¢. The agency also considered government allocations of copper calling for 60% of the allotment to be domestic metal priced at 24½¢ and the other 40% entitlement for the higher priced foreign metal.

Permits 10% Allowance . . . The price agency has permitted wire and cable prices to reflect an allowance of 10% for scrap and an increase to the nearest eighth of a cent. Here's how it works. The base increase is 3.84¢ a lb to reflect the 40% foreign copper. The 10% for scrap would bring the price up to 4.224¢ and the nearest eighth would be 4.25¢ a lb.

These companies have made price increases. Anaconda Wire & Cable Co, General Cable Corp, and Phelps Dodge Copper Products Corp have announced increases in prices of bare, weatherproof, and magnet wire ranging from 3¼¢ a lb to 4¼¢ a lb for less than carload lots. Bare copper wire is now 33.42¢ a lb compared with the former price of 29.17¢; weatherproof wire is 34.35¢ a lb against 31.10¢, and magnet wire is 39.50¢ compared with a previous 35.25¢.

Revere Copper & Brass, Inc, has boosted its prices for pure copper products by 3.84¢ a lb. Revere's brass and other alloy products have been increased 1.22¢ a lb for free turning brass rods up to 2.96¢ a lb for red brass.

With brass and other alloy products using zinc, quotations provide for an adjustment for the lower price of zinc, currently quoted at 15¢ a lb or 4½¢ below the OPS ceiling.

Slated for Revision . . . To take into account the changes in the foreign price of copper, a price official said the adjustment will be revised from time to time. The first revision will be announced Sept. 15.

OPS has announced that the regulation for copper wire mill products is called Ceiling Price Regulation 110. The regulation for brass mill products is Amendment 1 to CPR 68.

On the supply side, things are really looking bright. The copper shortage—which last year had defense mobilizers worried sick—is no longer critical. The July allocations are the biggest since controls began.

The July allocation consists of 80,000 tons from domestic sources and 53,333 from foreign sources. In order to distribute equitably the burden of using high-cost foreign copper, NPA will make allocations to each user which will be made up of 60% U. S. metal and 40% foreign.

This arrangement will provide domestic brass mills with 37,327 tons of domestic copper and entitlements to buy 24,884 tons of foreign—or a total 62,211 tons for July.

Wire mills will get 63,722 tons during July with the same 60-40 metal allocation.

Encourage Foreign Purchases . . . NPA boosted its July allocation because it expects users will be able to purchase larger amounts of foreign copper than they have been able to get for many months. The agency believes this will take place as a result of its price formula which allows users to pass on most of the extra cost of foreign copper above the domestic ceiling price.

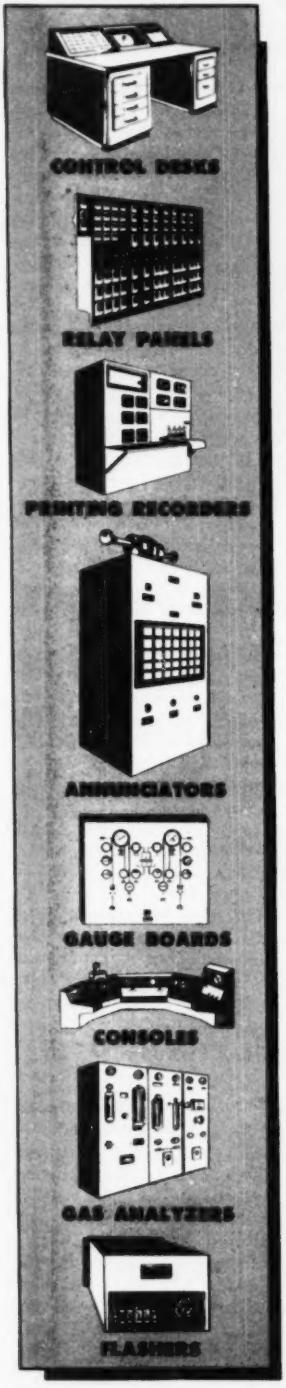
Long range, though, the outlook is for a copper shortage.

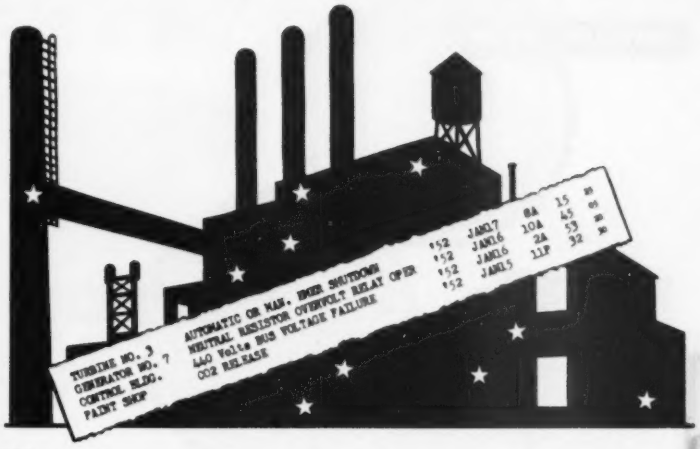
President Truman's Materials Policy Commission has reported that demand for copper in the United States should grow about 45% over the next 25 years. By 1975 a half million

Kellogg's New Plastic Demonstrated

Dramatic demonstration of the physical properties of KEL-F was made by Louis C. Rubin, manager of the Chemical Manufacturing Division, M. W. Kellogg Co, at a press luncheon held recently in New York. A strategic fluorocarbon-type plastic, this material showed extraordinary resistance to heat, moisture, and chemical action. Applications in the electrical field include coated wire, coil forms, tube socket bases, rotary switches, and transformer terminals.

ENGINEERED EQUIPMENT FOR EFFECTIVE PLANT CONTROL





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An illustrated folder on J. Neils treated poles, and information regarding their application to your requirements, will be furnished gladly on request.

J N **J. Neils Lumber Company**

Pole Division: LIBBY, MONTANA

more tons may be required each year from domestic mines and imports. (Between 1925 and 1950, U. S. copper demand increased by about 70%.)

Highest Production . . . According to the commission, the highest average annual production that can be expected is 800,000 tons—somewhat below 1950 and 1951. The United States will have to double copper imports by 1975 to about 1 million tons to meet demand. U. S. copper consumption in 1950 was 1.7 million tons, a level reached previously only in 1948 and during World War II.

In projecting copper demand, the commission took account of the accelerated substitution of aluminum for copper. It pointed out that until the end of World War II, aluminum was much more expensive than copper and that it's now the other way around. Already, copper has been almost displaced in high-tension power transmission, is rapidly losing ground in urban power distribution, and is even having to meet the competition of aluminum in the windings of fractional horsepower motors and large generators.

Despite substitution, the commission stated demand for copper in the next 25 years will outrun supply.

To encourage copper expansion in the United States and Canada, the Defense Materials Procurement Agency has already signed seven commitment-to-purchase and six maintenance-of-production contracts; DPA has granted rapid tax write-off privileges to 12 producers; and the Reconstruction Finance Corp has granted a $57.1-million loan to the White Pine Copper Co, and is considering a bigger one (over $100 million) to the San Manuel Copper Corp.

MANUFACTURING BRIEFS

Defense Production Administration has told the aluminum production industry that it must earmark 31 million lb of aluminum in the fourth quarter for replenishment of the nation's stockpile of the metal.

The government will purchase 30,000 tons of lead by Dec. 31 to hold as a reserve supply to be certain that the metal is available for defense uses. The metal will be purchased at market prices.

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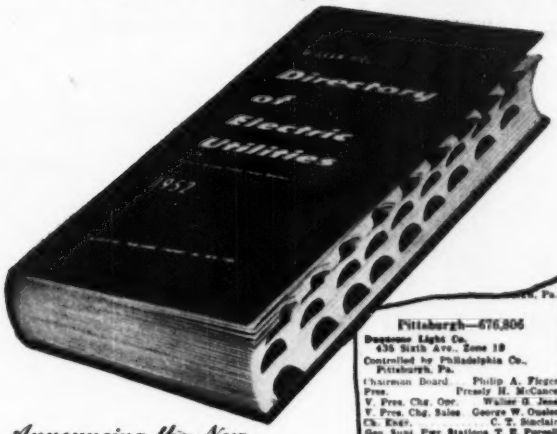

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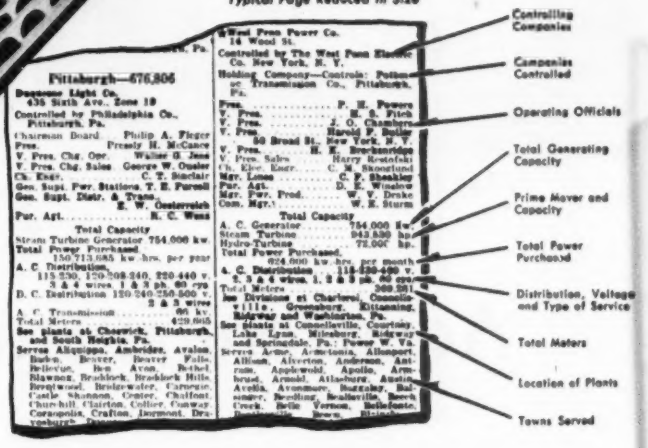
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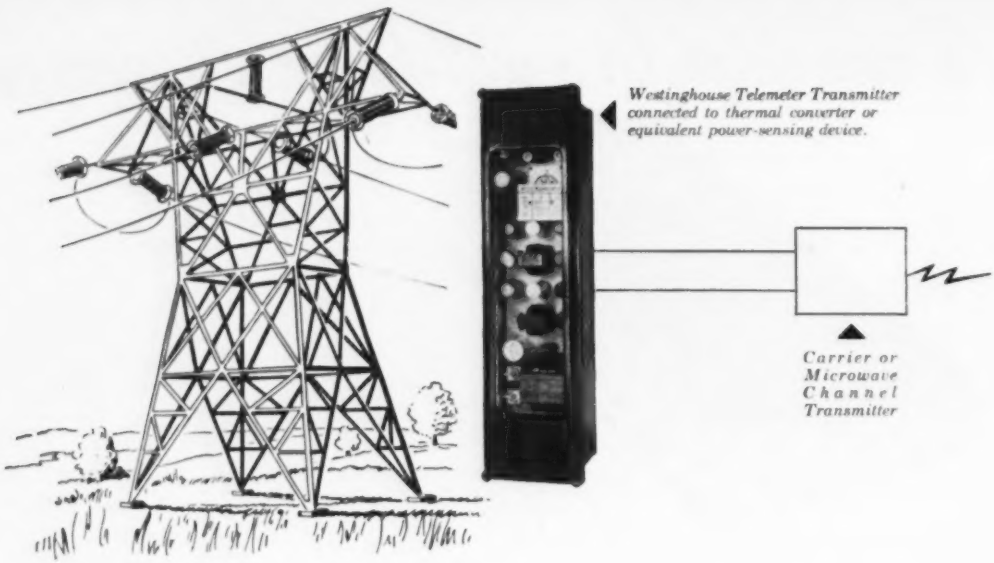
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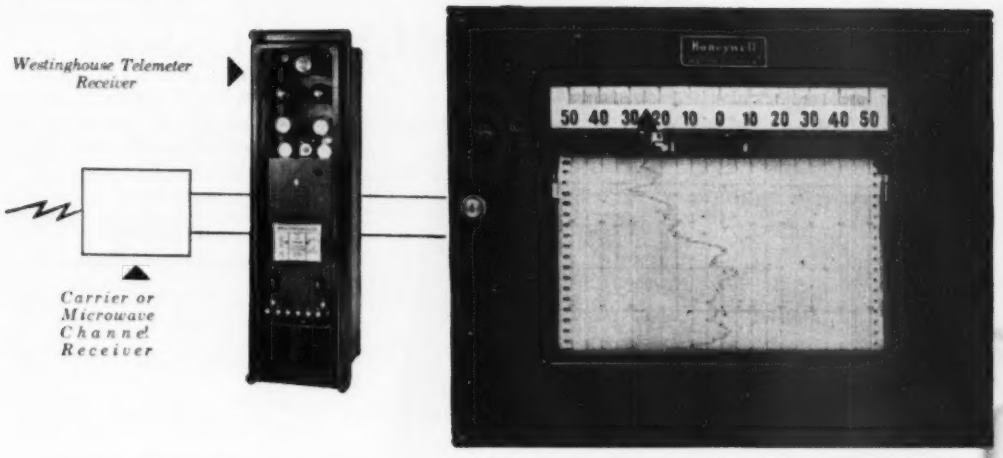

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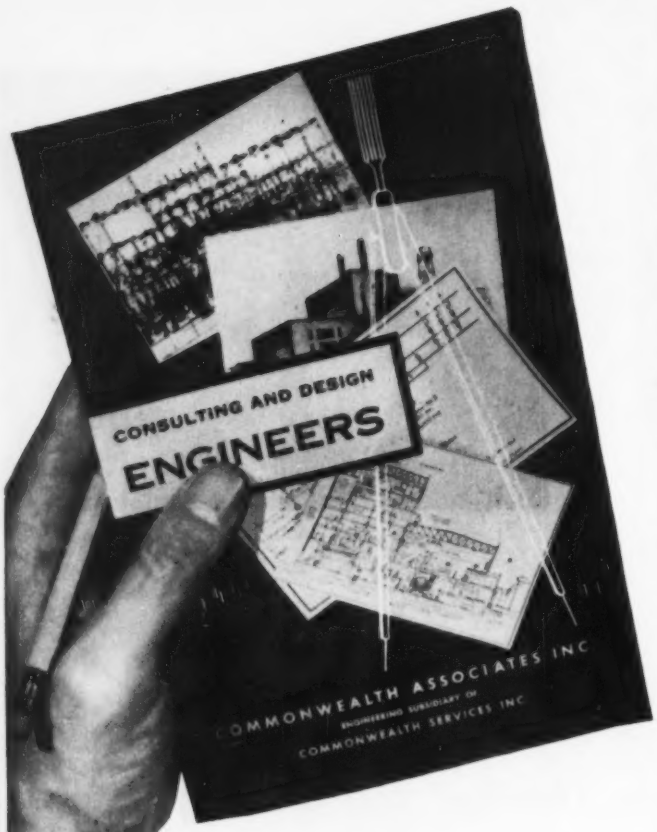

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California—Pacific Gas & Electric Co., 245 Market St., San Francisco, 21,500 ft. pressure tunnel, appurtenant structure for company's Pit River No. 4 power project, in Shasta Co.

Ga., Columbus—Radio Columbus, Inc., Station WDAK, Martin Bldg., TV station. $300,000.

Md., Cheltenham—Dist. P. Wks. Office, Potomac River Naval Command, Naval Gun Factory, Wash., D. C., exten. electrical distr. sys. Naval Radio Station. NOY 73402, Spec. 34528. Plans deposit $10.

Md., Rockville—U. S. Eng., First and Douglas Sts. N. W., Wash., D. C., electrical distr. sys., Army Medical Center, ENG 49-080-52-28-(25).

Minn., Virginia—City, Water & Light Comn., F. T. Borg, secy., furnish, install mech. and electrical equipment for municipal power plant. $82,000. Plans deposit $30. Pfeifer & Shultz, 702 Wesley Temple Bldg., Minneapolis, engrs.

Mo., Eldorado Springs—Sac-Osage Rural Electric Assn., Eldorado Springs, plans by Richard Stahl, 530 S. National St., Springfield, shop and warehouse with offices. $100,000.

Nebraska—Valley Electric Membership Corp., O'Neill, 519 mi. rural distr. lines, Holt, Boyd, Knox and Garfield Counties. $625,000. Henningson, Durham & Richardson, Standard Oil Bldg., Omaha, consult. engrs.

Neb., Nebraska—City, Victor Bremer, mayor and Bd. P. Wks., J. W. Gangel, chn., City Hall, furnishing, del. generating equip., incl. one dual-fuel diesel unit complete with engine, generator, exciter and auxiliary equip. $215,000. Henningson, Durham & Richardson, Inc., 626 Standard Oil Bldg., Omaha Zone 2, engr.

N. Y., Queens Village—Bureau Contracts & Accounts, The Governor Alfred E. Smith State Office bldg., Albany, electric work for turbine generator set and new switchgear, Power House, Bldg. "R", Creedmoor State Hospital. Plans deposit $30.

South Dakota—U. S. Eng., 1709 Jackson St., Omaha, Neb., disconnect switches and lighting arresters at Oahe Reservoir Proj., near Pierre. Inv. 52-144.

Tenn., Chattanooga—Graybar Electric Co., Inc., 1222 Carter St., plant addns., $125,000.

Texas—Deep East Texas Electric Cooperative, San Augustine, rural distr. lines, San Augustine Co. $210,000.

Texas—West Texas Electric Co-operative, Hereford, rural distr. lines, sys. imprvs. Deaf Smith Co. $257,000.

Va., Norfolk—Virginia Electric & Power Co., Bough and Bute Sts., plans by T. David Fitz-Gibbon, Royster bldg., 1 and 2 story, 68,000 sq. ft. concrete and steel service center, incl. transformer and electric shop and garage bldg. $1,000,000. Joe H. Berry, c/o owner, dist. mgr.

Va., Portsmouth—Dpt. Navy, Fifth Naval Dist., U. S. Naval Base, Norfolk, 4 and 6 story, 170x456 ft. rein.-con. frame electronics bldg., cast-in-place concrete piles and fdn. work. $6,500,000. Harley, Ellington & Day, 153 E. Elizabeth St., Detroit, Mich., and Hayes, Seay, Mattern & Mattern, 118-A Campbell Ave. S.W. Roanoke, consult. engrs.

Va., Williamsburg—College of Wil-

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ALL ALUMINUM NEUTRAL MESSENGER				
6	7	2	6-7	95
		3		105
4	7	2	4-7	145
		3		158
2	7	3	2-7	238
		4		253
1	19	4/64	1-7	315
1/0	19	4/64	1/0-7	387
2/0	19	4/64	2/0-7	476
3/0	19	4/64	3/0-7	611
4/0	19	4/64	4/0-7	752
ACSR NEUTRAL MESSENGER				
6	7	2	6-6/1	107
		3		117
4	7	2	4-6/1	165
		3		176
2	7	3	2-6/1	267
		4		284
1	19	4/64	1-6/1	353
1/0	19	4/64	1/0-6/1	434
2/0	19	4/64	2/0-6/1	536
3/0	19	5/64	3/0-6/1	687
4/0	19	5/64	4/0-6/1	847
ACSR REDUCED SIZE NEUTRAL MESSENGER				
4	7	2	6-6/1	144
		3		155
2	7	3	4-6/1	233
		4		250
1	19	4/64	3-6/1	329
1/0	19	4/64	2-6/1	404
2/0	19	4/64	1-6/1	467
3/0	19	4/64	1/0-6/1	600
4/0	19	4/64	2/0-6/1	737

NEOPRENE TRIPLEX SELF-SUPPORTING ALUMINUM CONDUCTOR

PHASE CONDUCTORS			NEUTRAL MESSENGER	
AWG Size	Stranding	Cover Thickness in 64ths"	Size & Stranding	Nominal Wt. Lbs. Per 1,000 Ft.
ALL ALUMINUM NEUTRAL MESSENGER				
6	7	4	6-7	149
4	7	4	4-7	214
2	7	4	2-7	305
1	19	5	1-7	402
1/0	19	5	1/0-7	483
2/0	19	5	2/0-7	582
3/0	19	5	3/0-7	715
4/0	19	5	4/0-7	869
ACSR NEUTRAL MESSENGER				
6	7	4	6-6/1	161
4	7	4	4-6/1	232
2	7	4	2-6/1	335
1	19	5	1-6/1	440
1/0	19	5	1/0-6/1	530
2/0	19	5	2/0-6/1	682
3/0	19	6	3/0-6/1	831
4/0	19	6	4/0-6/1	1006
ACSR REDUCED SIZE NEUTRAL MESSENGER				
4	7	4	6-6/1	211
2	7	4	4-6/1	301
1	19	5	3-6/1	416
1/0	19	5	2-6/1	500
2/0	19	5	1-6/1	573
3/0	19	5	1/0-6/1	702
4/0	19	5	2/0-6/1	853

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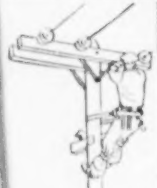

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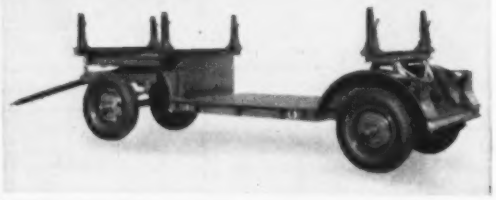

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Wyoming—Lower Valley Power & Light, Inc., Freedom, 389 mi. rural distr. lines, 90 mi. transmission lines, sub-stations, generating facilities, communication equip., Lincoln Co. $2,700,000.

Low Bidders & Contracts Awarded

Calif., El Centro—Charles W. Pettifer, 703 W. 14 St., Long Beach, Calif., CA, $639,264, power plant and appurtenances, Imperial Irrigation Dist., El Centro, Calif. Bids May 6, awarded June 10 (Low Bidder refused to accept the contract due to an error). Formerly reported June 16 issue p. 246 as Contract Awarded.

Calif., Fort Ord—Del E. Webb Constr. Co., 5101 San Fernando Rd., Los Angeles, 39, Calif., LB, $2,094,783, construct utilities., ENG 04-203-52-12 U. S. Eng., 180 New Montgomery St., San Francisco, Calif. Bids June 24.

Fla., Camp Blanding—W. D. Owens Constr. Co., 3800 16 St., N. St. Petersburg, Fla., CA, $1,433,348, rehabilitation of water, sewer and power systems, U. S. Eng. P.O. Box 4970, Jacksonville, Fla. Bids June 17.

Kans., Wichita—Shelley Electric Co., 1024 S. Santa Fe St., Wichita, Kan. CA $110,000, unit sub-station. Boeing Airplane Co., Personnel Bldg., Wichita, Kan. Wilson & Co., 223½ S. Santa Fe St., Salina, Kan., engrs. Bids June 6.

La., Chalmette—Tellepsen Constr. Co., P.O. Box 2536, Houston, Tex. CA. Approx. $100,000. Power plant addn. Kaiser Metal Products, Chalmette, La.

Minn., Moose Lake—Fairbanks, Morse & Co., 220 E. 5 St., St. Paul, Minn. CA $110,000, 1,600 hp. opposed-piston engine, 1,136 kw. in municipal power plant, Village, Public Utilities Comn., J. Mohelski, chn., Moose Lake, Minn. Bids June 19.

Mo., Grandview—Schneider & Son Constr. Co., Inc., 1006 Grand St., Kansas City, Mo. LB $73,243, receiver bldg., transmitter bldg., ANCRD facility, Grandview Air Force Base, Inc. 52-60, U. S. Eng., 601 Davidson Bldg., Kansas City 8, Mo. Bids June 12.

N. C., Fort Bragg—H. G. Bryant Electric Corp., Acme, N. C. CA, $109,069, conversion of primary electric distr. sys., Inv. 52-28, U. S. Eng., 508 Customhouse, Wilmington, N. C. Bids June 24.

Oregon—Woodward Governor Co., 5001 N. 2 St., Rockford, Ill. LB $1,017,491, ten 111,360 hp. hydraulic turbine governors and accessories for Units 5 to 14 inclusive, McNary Dam, Inv. 52-111, U. S. Eng., City-County Airport, Walla Walla, Wash. Bids June 24.

S. C., Charleston—Gaston Electric Co., N. C. LB $183,530 electrical distr. sys. at Gastonia, Charleston Air Base, No. 38-081-52-86, U. S. Eng., Custom House, Charleston, S. C. Bids June 24.

Utah—Idaho Falls Electric Co. and Fonnesbeck Electric Co., 275 Broadway, Idaho Falls, Idaho. LB $145,080, construct 140 mi. 7.2/12.5 KV distr. lines, at Mt. Emmons. Moon Lake Electric Assoc. Inc., Mt. Emmons, Utah. Bids Apr. 30.

Wash., Seattle—Geo. Teufel Co., Skinner Bldg., Seattle 1, Wash. LB, $215,739, est. $180,000, 216x352 ft. rein.-con. electrical mfg. plant, Square D Co., 1409 Dearborn St., Seattle, Wash. Bids June 24.

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Proposed Construction

Ill., Chicago—Prudential Life Insurance Co., 762 Broad St., Newark, N. J. substructure only 41 story office bldg. $40,000,000.

La., Lafayette — Maurice Heymann, Lafayette, office, $1,500,000.

Mich., Detroit—At office Harley, Ellington & Day, Inc., archt., 153 E. Elizabeth St., 14 and 20 story, base, sub-base, brick, steel, concrete city-county bldg. for Detroit and Wayne County, City-County Bldg. Auth., Detroit, Mich. $17,000,000.

Va., Norfolk—Esso Standard Oil Co., 201 Hampton Blvd., oil refinery, $50,000,000.

Wash., Richland — Atomic Energy Comn., 1901 Constitution Ave. N.W., Wash., 25, D. C., facilities at Hanford Works, $346,000,000.

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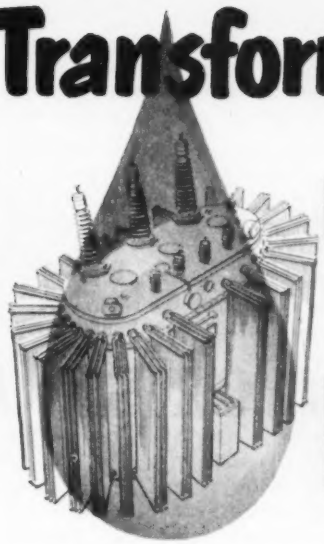

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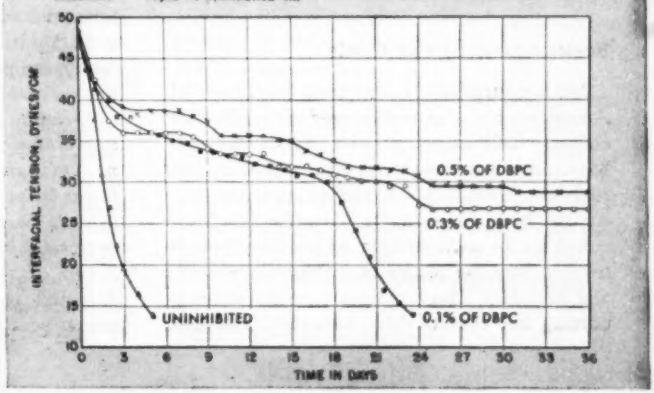

Aid or Trade?
A CRISIS AHEAD

A crisis in the foreign trade relations of the United States is in the offing. It is a crisis caused by:

1. Efforts of producers in friendly nations to earn more dollars by increasing exports to the United States, and
2. Efforts of industries in the United States which would be hurt by competition from these imports to keep them out.

This crisis is a threat to the effectiveness of American leadership in the crucial effort to build the nations of the free world into a strong and unified group. It is the purpose of this editorial to advocate a constructive approach to the difficult situation that is developing.

Background of the Crisis

Most countries in the free world—with American aid—have managed to push their outputs well above prewar levels. As they have done so, they have been urged by our highest government officials to increase their exports to us. Sales in our market enable these countries to earn dollars which they use in turn to buy the products of America's farms and factories. Thus, as they become self-supporting, the need of American aid is reduced.

But as these efforts to export more to the United States have promised increasing success, competitive American producers have become increasingly alarmed about what that success might do to them. Consequently, they are seeking more protection—by appeals to the U. S. Tariff Commission to recommend higher import duties and by appeals to Congress for new laws to discourage imports.

Our Friends Protest

A year ago Congress answered one of these appeals by imposing a quota on imports of dairy products. Now, among many other legislative proposals being strenuously pressed is a move to extend the scope of "Buy American" legislation. A year ago the U. S. Tariff Commission had only four petitions for increased import duties on its docket. Since then fourteen more petitions have been filed and others are definitely on the way.

Faced by these mounting efforts to block the sale of their products in the American market, no less than eleven friendly nations, including Great Britain, France, Italy, Canada, the Netherlands, Switzerland and Denmark, have filed protests with our State Department. Through many of the protests runs one refrain. Although stated in diplomatic language, it might be correctly paraphrased to say: *"In*

sending us aid you have made it very clear that you want us to get on a self-supporting basis at the earliest possible moment. But, when we begin to make headway in that direction by trying to sell you more of the things we are equipped to produce, you start closing your market to us." The threat of European resentment against the United States being stirred up by this argument is obviously great.

At the same time there exist grounds for special resentment in the United States against certain prospective imports of European manufactured goods—those of machine tools, for example. In part these will be produced with machinery that has been sent to Europe as part of our economic aid program. With absolutely no diplomatic language involved, the argument, which will be extended much farther than the facts would justify, will run: "*We gave those people the equipment that they now use to cut our throats!*" This line of argument will find response among workers as well as employers in industries faced by more competition from imports. Labor, too, is keen for protection against more foreign competition.

Aid or Trade?

As between continuing direct economic aid to Europe or accepting the imports that would make those countries self-supporting, some would prefer to continue the aid program. They argue that the tax machinery of the federal government can spread the burden of aid broadly, while we have no comparable machinery that can cushion the shock to individual industries, firms and communities that may result from stepped-up imports of competitive products.

As we see it, this position is untenable. It would make rubbish of our Atlantic Charter promise ". . . to further the enjoyment by all States, great or small, victor or vanquished, of access, on equal terms, to the trade and to the raw materials of the world which are needed for their economic prosperity." It would be an admission that, for all our profession of faith in competition and our opposition to European cartels, we really don't believe in competition.

U. S. Self-Interest

The people of this country have invested billions of dollars and seven years of hard work in the attempt to put our allies on a self-supporting basis. If we keep their goods out by raising trade barriers, we are directly defeating our own purposes.

Also, in moving to protect some groups of American producers we should be hurting others. For many American producers the export market, which this year will take about $14 billion of civilian goods, spells the difference between operating at capacity and closing down 25% of their facilities. When we discourage imports we cut off dollar earnings by other nations which are spent here to keep some of our factories and farms going.

At the same time, it must be recognized that certain American industries and their capacity to maintain employment will be hurt by increased imports. Hence it becomes critically important for the United States to formulate a national program designed to help these industries and communities take up the shock.

There is no neat and simple prescription by which this can be done, but several possibilities have been suggested. One on which there is general agreement is that tariff reductions should be gradual. To cushion their impact, the government might well give preference on defense orders to industries and areas adversely affected by an increased volume of imports. Direct assistance to workers and companies in shifting to different lines of business may be worth consideration.

These are by no means all the possibilities. They may not even be the best. But they do serve to suggest the necessity for flexibility and imagination in dealing with the growing crisis in trade relations. *Our ingenuity in developing new ideas to meet this crisis may well be a decisive factor in our effort to weld the free nations into a strong and durable alliance.*

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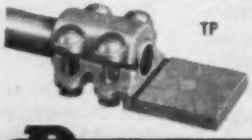

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1. FAN FOUNDATIONS ON GROUND FLOOR COST LESS than those high up. If necessary to install high up, supporting steel must be adequate for fan weight, fan rotating effect and concrete pad under fan.

2. GOOD ENGINEERING DESIGN INSURES MAXIMUM SERVICE. "Buffalo" Draft Fans, with their heavy rotors, shafts, bearings and housings, bear this out with their records of endurance on the job in every industry.

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AIEE Meeting

(*Continued from page* 146)

completed transformers, would have been a more direct method of determining the location of moisture Curdts felt. The a-c corona test he thought might serve advantageously as a supplement to other tests.

L. J. Berberich, Westinghouse, agreed that power factor testing of transformers is useful but with dry-type insulation fails to show up some defects.

Power factor maintenance programs unless very carefully administered may well condemn a great deal of very serviceable insulation E. C. Wentz of Westinghouse thought. His discussion was presented by H. L. Cole, Westinghouse. Expenses, he said, may be much more than would result from insulation failure.

The test type of transformer described by B. A. Cogbill, will find great usage in the supervoltages now being discussed, in the opinion of J. R. Meador of General Electric Co.

Transformer Impulse Testing

Standard Basic Impulse Insulation Levels—450 kv to 1050 kv Inclusive. Report of joint AIEE-EEI-NEMA Committee on Coordination of Insulation

Previous report, adopted May 1950, established impulse levels on premise of non-grounded system operation. Present revision provides for non-grounded and effectively grounded system operation.

Impulse Testing of Power Transformers. J. H. Hagenguth and J. R. Meader, both *General Electric Co*

Describes methods of impulse testing power transformers and detection of failures on test. Analyzes relative value of failure indicators, classifies failures, and indicates the place of low-frequency tests and the relationship of impulse tests to low frequency tests. Emphasizes importance of careful tests on power transformers.

New Apparatus Bushing with Improved Characteristics. R. N. Anderson and D. L. Johnson, both *General Electric Co*

Describes new liquid-filled bushings for 15-kv through 69-kv ratings. Center-clamp design eliminates cemented-on clamping rings. Requires less materials and reduces manufacturing cycle. Thermal, mechanical, and electrical tests made.

A New Method of Obtaining Insulation Coordination of Transformers. W. C. Sealey and E. J. Vogel, both *Allis-Chalmers Mfg Co*

Tests based on additional data on service stresses. Designed to determine possible changes in insulation requirements to effect economies and meet service re-

The *Original Prod-Mount Voltage Tester* is the KNOPP

Patents Pending

Say "Goodbye to risky time-wasting fuss in testing" with the 5 main safety features in the KNOPP Voltage Tester: (1) original Prod-mounting Socket in housing making this tester easier, faster, and safer to use and ending time-wasting "three-handed" testing; (2) protection through Dual indication of voltage by solenoid and neon lamp working independently; (3) positive scale readings; (4) signal by hum and vibration; and (5) thorough insulation throughout, even to the sharp point of each prod.

Well-built and shockproof in a LAMINATED bakelite housing, the KNOPP Voltage Tester tells immediately and simply if circuit is open or closed; magnitude of voltage between 110 and 600; a-c or d-c, pure or rectified; 25 or 60 cycles—for testing old and new circuits, fuses, locating grounds, etc.

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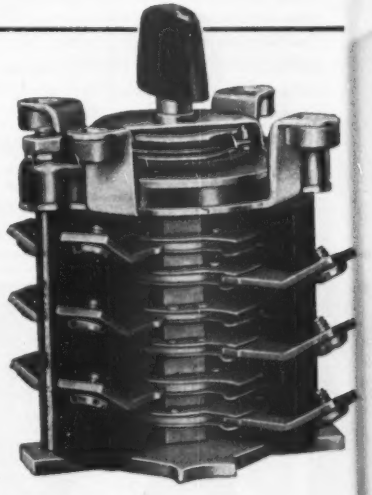

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Ratings: The Type-JR rotary switch is rated at 10 amperes, 125 volts AC, or 5 amperes, 125 volts DC. The Type-P rotary switch — a high-speed snap-action switch — is available in these same ratings, and also in heavier designs for 30, 60, 100, or 200 amperes at 500 volts AC or 250 volts DC.

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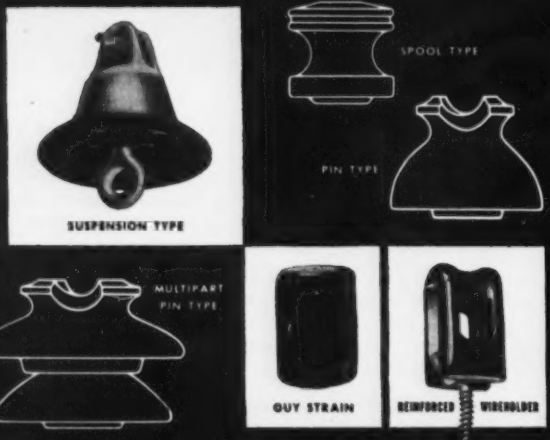

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quirements. Lightning and switching determine insulation required, not continuous 60-cycle values.

Methods of failure detection described in the Hagenguth-Meador paper or impulse testing of power transformers are a definite step in the direction of saving costs, H. L. Rorden, Bonneville Power Administration, said in discussion presented by J. B. Hodtum, Allis Chalmers Mfg. In Rorden's opinion a more realistic picture of types of surges found in practice is desirable.

Complete tests of power transformers under present standards are time consuming but some modification of test requirements for production testing of large numbers of units is in order in the opinion of H. S. Hubbard of General Electric Co.

Discussion of the Sealey-Vogel paper indicated differences of opinion. W. L. Teague of Westinghouse Electric Corp agreed that ingenuity in design should be encouraged but recommended caution in going down two whole voltage levels. J. R. Meador of General Electric Co did not want transformers so skimped that any little thing would cause them to collapse. He asked if the authors were requesting a change in the standards. Vogel said they were not asking for a change in the standard but that they were prepared to furnish transformers based on the design described.

Relay Developments Discussed

Ground Fault Relay Protection of Transmission Lines. J. L. Blackburn, *Westinghouse Electric Corp*

A general review of the principles and practices of ground fault relay protection of transmission lines.

Power Line Carrier for Relaying and Joint Usage—Part II—A Survey of Modern Power Line Carrier Systems. G. W. Hampe and B. Wade Storer, both *Commonwealth Edison Co*

Second of a pair. Emphasizes relaying techniques involved in the subject. Covers problems of multi-terminal lines application of carrier to them.

Selecting AC Overcurrent Protective Device Settings for Industrial Plants. F. P. Brightman, *General Electric Co*

Present basic data and factors involved in making a relay study to determine time-current characteristics required for coordinated operation of various short circuit protection devices. Procedure in using material to make study outlined.

Objections to continuous phase comparison, as reflected in Hampe-

an ACCO product

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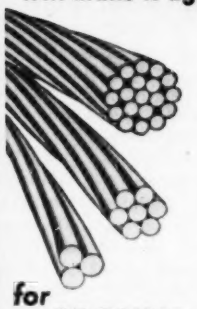
will make it again



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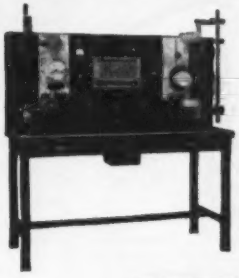

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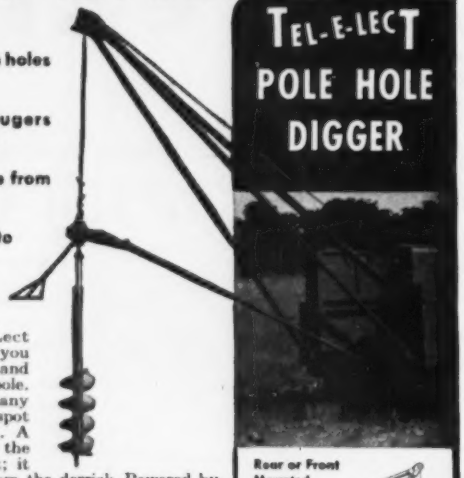

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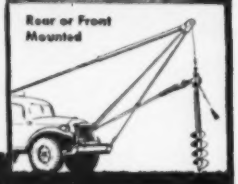

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Storer paper were contributed by L. F. Kennedy of General Electric Co and include:

1. Use of three channels or tones in place of one. 2. Increased cost of relays and channels. 3. Load current, and in some cases line charging current, contribute to application limitations.

Zero-phase sequence induction in most cases cannot be offset by potential polarization.

The use of line potential rather than bus potential to polarize ground relays is not justified.

In Kennedy's opinion no line is too short for directional-comparison protection.

Nor will crowding of the carrier frequency spectrum necessarily force joint use of carrier equipment for relaying and other functions. There are quite a few installations of carrier over power cables and limitations and possibilities of various types of cable construction have been demonstrated.

Saving in spectrum by the application of frequency inversion is not apparent S. C. Bartlett, American Gas & Electric Service said. The important feature of this novel application is in the potential saving of equipment.

Power Line Carrier Developments

A Broad Band Coupling Unit for Power Carrier with Associated Potential Device. John A. Doremus, R. P. Crow, W. H. Freeman, all of *Motorola Inc, Chicago, Ill.*

Describes broad-band coupling system, using a single coupling capacitor, which provides a connection to the power line for a large number of transmitters and/or receivers operating in the 50-200-kc region.

New Method of Calculating Carrier Current Attenuation. John A. Becker, *Westinghouse Electric Corp*

A new method of calculating attenuation based on amperical data and consideration of impedance levels.

Frequency-Shift, Carrier-Current Equipment for Telemetering and Other Control-Type Functions. R. W. Beckwith, *General Electric Co*

A very narrow band, frequent-shift, power line, carrier-current system is described. Circuit operation is explained, and it is shown that oscillation is controlled by the crystals at two frequencies and operation shifted from one to the other by a variable reactance circuit connected across oscillator-tuned circuit.

Application of Power Line Carrier by Analogue Computer Studies. J. D. Moynihan, *Westinghouse Electric Corp*

Characteristics of power line carrier channels can be predicted if an analogul computer study is made of critical portions of the power systems used for the

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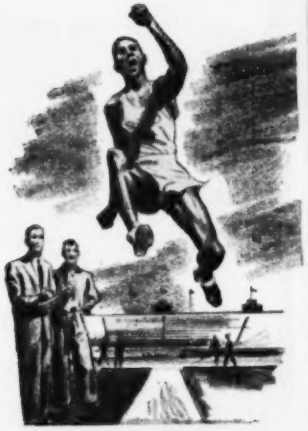

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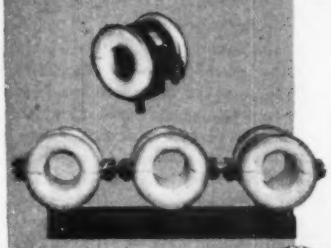

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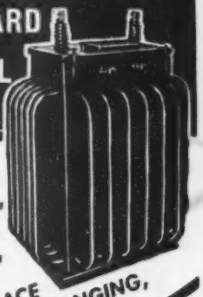

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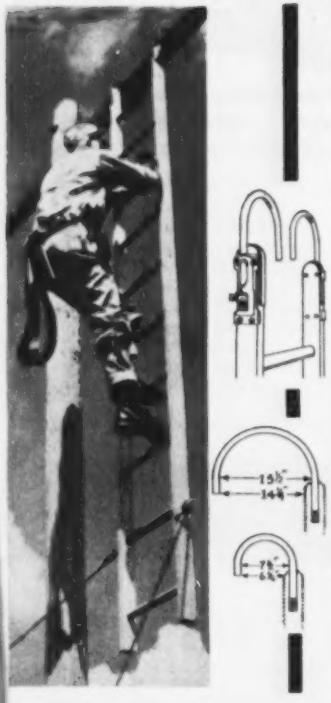

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channels. Paper points out conditions ignored in past and means of measuring characteristics of coupling networks and adjacent power equipment of the proposed channel before it is installed.

The Application of Power Line Carrier-Coupling Equipment to Typical Installations—Part I. F. B. Gunter, Westinghouse Electric Corp

Discusses factors important in establishing an adequate transmission path for power line carrier. Part I discusses requirements placed on this path by typical carrier services and proposes methods of determining if a given channel is suitable for a particular service.

Becker's new method of making carrier circuit calculations was greeted enthusiastically, but only as an interim measure to be used until the analog computer or calculating board methods used for 60-cycle calculations could be made generally available.

B. W. Storer, Commonwealth Edison, said equipment described by Beckwith would help reduce frequency crowding and that it could also be used for directional comparison carrier relaying.

Three other types of circuits that perform the function of tuning the capacitor, described by Doremus, were listed by R. W. Beckwith, General Electric. J. E. Clem, General Electric, said output depends on line-to-ground voltage. He questioned whether higher voltage accounted for differences between the device described by Doremus and other devices available.

BOOK REVIEWS

Acoustics

Musical Engineering. By Harry F. Olson. Published by McGraw-Hill Book Co, New York 36 369 pages, illustrated. Price $6.50

This book covers the nature of sound, music, acoustics, and hearing in both their physical and psychological aspects. It will aid in study measurement and analysis of many types of audio problems. All musical instruments are described, with facts on their construction, range, and characteristics.

Statistics

Practical Rules for Graphic Presentation of Business Statistics. By L. Edwin Smart and Sam Arnold. Published by The Bureau of Business Research, Ohio State University, Columbus 10. 137 pages illustrated. Price $2.00

Basic rules for the construction of the most widely used types of business charts are presented in this book. Standardized is the treatment of the necessary elements of a chart. Rules are in outline form. This manual does not attempt to give alternate practices, but offers complete and easily followed basic instruction for

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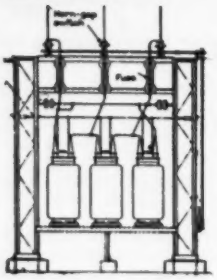

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Electricity

Beginning Electricity. **By J. R. Eaton. Published by The Macmillan Co, New York. 366 pages, illustrated. Price $5.50.**

This book on electricity is written for anyone who is not an electrical engineer, the person who is simply interested in learning about electricity and electrical equipment. The book uses fundamental terms and only basic mathematics. It describes "why" each of the basic electrical devices works as it does. Electrical concepts used in all electrical apparatus, dc equipment, ac equipment, and electronics are covered. The later chapters deal with metering and communications systems. The book is well worth while for electricians and home repair men because it emphasizes operating principles.

Electrical Engineering

Introduction to Electrical Engineering. **By Robert P. Ward. Published by Prentice-Hall, Inc, New York 11. 416 pages, illustrated. Price $7.65.**

A second edition, this book retains the comprehensive content of the first edition and incorporates recent advances in theory. The text stresses the "why" of doing the problems rather than just the application of a formula to get an answer. Over 500 problems plus 200 study questions are included in this edition. While this book was written primarily as text for engineering students, it also is a handy reference book.

Personalities

Electrical **Who's Who. Published by Iliffe & Sons, London. 322 pages. Price $2.75 (Through British Book Center, New York 22).**

Presented is a second edition compiling the professional and industrial affiliations of some 6,000 British electrical folk in power, manufacturing, research, association, contracting, consulting or government capacities. Pretty much everyone of consequence appears as an entry.

DC Machines

Direct Current Machinery. **By C. S. Siskind. Published by McGraw-Hill Book Co, Inc, New York 36. 319 pages, illustrated. Price $6.00.**

All obsolete material has been avoided for the sake of presenting a lucid interpretation of modern designs of d-c machines. Of unique interest to power men should be the treatment of the Amplidyne, showing how its distinctive two-stage-amplification properties were evolved from the Rosenberg generator, once the rule for train lighting.

Ferromagnetic Properties

Ferromagnetic Properties of Metals and Alloys. **By W. Jackson, H. Frohlich and N. F. Mott. Published by Oxford University Press, New York 11. 317 pages, illustrated. Price $8.00.**

While intended primarily for the advanced students and research workers this volume puts the well recognized advances in the art and practice of magnetic utilization into line with refined theory of the magnetization curve. At the outset it relates magnetism to the orbital configuration of the atom and then moves to the magnetization curve and its saturation characteristics in particular. Before proceeding to the specific magnetic properties of metals and alloys there is an orientation chapter on them for the benefit of the nonmetallurgist. However the treatment throughout is rather graphical than mathematical.

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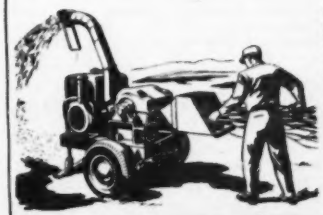

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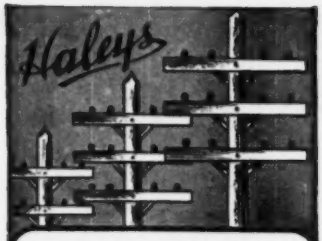

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CATALOGS • BULLETINS

● CURRENT REGULATORS: The functions and applications of direct acting, finger-type voltage and current regulators are analyzed in a new bulletin just released, entitled "Engineering Bulletin 505.00." In two colors, containing 12 pgs, the booklet tells how REGOHM provides close control of voltage frequency and current and its use in servo systems. Write the Electric Regulator Corp, 50 Day St, South Norwalk, Conn.

● SPECIALIZED FORGINGS: A new bulletin which illustrates and describes the expanded facilities of the Allegheny Ludlum Steel Corp, Pittsburgh 22, Pa, has been announced by that company. Data on equipment and production of their Los Angeles Forge Plant, its range of stock and its sales engineering representation is included. Copies may be obtained from the company.

● ALUMINUM PROTECTION: Brush "Alodine" is described in a new booklet "Protection for Aluminum" recently issued by the American Chemical Paint Co, Ambler, Pa. It shows "Alodine" in its application with simple hand equipment. Anyone interested in this protective coating chemical may write for this folder to the company.

● INDUSTRIAL LIGHTING: Ways to achieve better day lighting conditions in industrial plants through the use of light-directing prismatic block is described in a new booklet "Daylight for Industry." Based on research and experiments in hundreds of buildings and schools it may be obtained without cost by writing Mr. Ray Smolik, Sales Promotion Dept, American Structural Products Co, Ohio Bldg, Toledo, Ohio.

● VENTILATION FANS: The Chelsea Fan & Blower Co, Plainfield, N. J. has just issued a complete catalog, price sheet and engineering bulletin describing 30 fan types in over 200 sizes. Included are specifications, dimensions, installation diagrams and photographs. Literature is available upon request.

● ELECTRO PRODUCTS: P R Mallory & Co, Inc, 3029 E Washington St, Indianapolis 6, Ind, announced the completion of their Product Index, which provides specific information in condensed form concerning electromechanical, electrochemical, electronic, and metallurgical products. Designed to acquaint the engineer and layman alike with basic data on available products, it may be obtained from the company.

● FHP Gear Motors: The release of a new 8 pg, 2 color bulletin on fractional-horsepower gear motors listing 61 standard models, has been announced by the General Electric Co, Schenectady 5, N. Y. Designated GEA 5678 the publication describes the application of FHP gear motors and outlines a simple method of determining correct hp requirements with the use of an ordinary wrench and fish scale.

● SEALED RELAYS: A new general purpose hermetically-sealed relay for use in aircraft, shipboard and portable land-based electrical systems and electronic equipment is described in a new 4 pg bulletin. The relay was designed to meet or better the provisions of Joint Military Specifications for Relays. Copies of GEA 5729 may be obtained from the General Electric Co, Schenectady 5, N. Y.

● CONDUCTOR SHIELDS: Full details of the T & B Grounding Sheath Connectors are included in a 4-pg pamphlet recently released by the Thomas & Betts Co, Elizabeth 1, N. J. Copies may be obtained by writing to the company.

● BLADE MECHANISM: Publication

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the consultants whose cards appear on this page with the confidence justified by the offering of these special services NATIONALLY.

4897, released by the Delta-Star Electric Co, 2437 Fulton St, Chicago, Ill, discusses the new MK-40 switches of 400, 600 and 1200 amperes. They employ high pressure silver to copper contacts at both ends of their tubular blade, a straight line current path with minimum number of current interchange surfaces and overall design providing superior electrical and thermal characteristics.

● ALUMINUM CONSERVATION: A new booklet containing material on efficient use of available supplies of aluminum as well as proper handling of scrap has recently been made available. The 8 pg catalog on this strategic lightweight material may be obtained from the Aluminum Assoc, 420 Lexington Ave, New York 17, N. Y.

● DRY TYPE TRANSFORMERS: A new booklet has been issued recently by Pennsylvania Transformer. The booklet, No. 951, describes the dry-type transformers with Class H insulation. A description of Class H insulation, and advantages and applications of these transformers is included. Pennsylvania Transformer Co, Canonsburg, Pa.

● HP AIR DISTRIBUTION: In the field of high pressure air distribution an informative 4 page bulletin has been released by Barber-Colman Co, Rockford, Ill. Typical information on noise levels, pressure drop and helpful diagrams are included. Copies may be obtained by writing for bulletin F4960.

● PLATING POWER: A new booklet, "A Guide to Better Plating Power" has just been published by Bart-Messing Corp, 229 Main St, Belleville, 9, N. J. It contains descriptions, drawings and photos of a complete line of Sel-Rex Selenium Rectifiers. Dc power requirements are clearly discussed with equipment recommendations to give the ultimate in low cost efficient operation. Copies are available upon request.

● ELECTRONIC CALCULATING: Two methods of extending bill accounts, the Master Card Method and the IBM electronic Calculating Punch Method and other accounting procedures, including service order preparation, meter reading, revenue accounting, bill preparation, remittance accounting and cash posting are explained briefly in a new booket recently published. It can be obtained by writing to the International Business Machine Corp, 590 Madison Ave, New York 22, N. Y.

● SILICONES: "What's a Silicone" is a new 32 page booklet published by the Dow Corning Corp, Midland, Michigan. This catalog explains fully the use of their product in all various ways. Copies may be had by writing to the company.

● Dc POWER SUPPLY: Bulletin V1051, a recently released bulletin, fully describes the Varicell dc power supply manufactured by the Superior Electric Co, Bristol, Conn. It is complete with photographs, circuit diagrams, outline dimensions ratings and descriptive data. Shown in easy reading form it can be obtained free by writing R. F. Greene care of the company.

● MOTOR AND CONTROL: Application of both motors and their controls to the chemical industry is the theme of a new 32 pg bulletin made available by Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa. Each of the eight sections of the bulletin treats a general application problem common to the chemical industry. For a copy of B-4792 write to the company.

● PANELBOARDS: The Minneapolis-Honeywell Regulator Co, Wayne and Windrim Aves, Philadelphia, Pa has announced the availability of their new 32 pg booklet describing conventional and graphic type panelboards. Interested persons should direct their inquiries to Station 40 at the above address.

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SALARY

Commensurate with qualifications.

Write, giving full particulars of education, experience and salary to:

P-4219, Electrical World
330 W. 42 St., New York 36, N. Y.

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For modern new high pressure steam electric generating plant in the Southwest area of the United States. Prefer graduate mechanical engineer, or equivilent, with adequate experience and qualifications to assume complete supervision of plant operation and maintenance. Good working conditions and opportunity for advancement. Preferred age 35 to 45 years. All applications will be acknowledged. Salary commensurate with qualifications. Please send personal record to

P-4185, Electrical World
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P-4591, Electrical World
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Kelvin (Wheatstone) Bridge

Range from .0001 ohm to approximately 20 ohms
Need before July 20, 1952.

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MILL TYPE PEDESTRAL BEARING WOUND ROTOR MOTOR

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TURBO GENERATOR
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7500 KW G.E. Co.
180 P.S.I.—525°F Total Temp.
2 phase 30 cycle 2300 volt
With Surface Condenser
GOOD CONDITION
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SALES, AGE 25-35, some technical background desirable contacting utilities industry, long-established specialized firm Chicago Branch. State age, education, experience, references, salary. SW-4437, Electrical World.

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DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3742) will be received at Denver, Colorado, until July 22, 1952, for furnishing two 14,400-volt, 4,000-ampere, 1,500,000-kva, outdoor power circuit breakers, which will be used for switching shunt capacitors; four 5,400-kvar, totally enclosed, outdoor power capacitor equipment, suitable for use on 12,470-volt, 3-phase circuit; two 15,000-volt 4,000-ampere, 3-pole, manually-gang-operated, disconnecting switches; and, six single-pole, 15-kv, outdoor lightning arresters for Phoenix Substation, Davis Dam Project, Arizona-Nevada. Delivery is desired within 240 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
2	333	G. E.	66000—2400/7200
2	75	A. C.	66000-24000—7200/12470 Y
2	200	West.	44000—2400/7200
4	2500	West.	44000—11000
2	150	G. E.	44000—7200/12470 Y
2	100	G. E.	44000—2300
3	75	West.	44000—7200/12470 Y
1	6333	West.	43800—13800
1	5000	G. E.	88100/66000—6600
1	18750	A.B.B.	34840—11000, 3 ph.
2	600	G. E.	33000—2300, 3 ph.
2	100	West.	33000—240/480 NEW
3	100	A. C.	33000—7200/12470 Y
3	75	Wag.	33000—7200/12470 Y
4	450	A. C.	25410/44000—13280/23000
6	150	G. E.	23000—7200/12470 Y
9	50	G. E.	22000—2300
3	37½	G. E.	22000—6900
9	200	G. E.	13200—2300
4	750	G. E.	11000—440
3	250	Pitts.	7200—220 440
4	25	Mot.	7200/12470 Y—120/240
3	333	Pitts.	6900/11900—550
3	150	Wag.	6900—2300
3	200	G. E.	6600/11430—575
1	37½	G. E.	6900—220/460
1	101	G. E.	4800/2400—480/240
1	125	G. E.	2300—230/460
1	100	G. E.	2300—575, 3 ph.
3	100	West.	2300—460/230
3	75	Mot.	2400—120/240
6	50	West.	2400—114/228 DRY TYPE
3	50	West.	2200—575

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1—600 A. 73 KV G. E. FHKO-236-500 MVA
1—400 A. 287 KV G. E. FHKO-236-500 MVA
1—1200 A. 15 KV G. E. FKO-139-350 MVA
1—600 A. 15 KV G. E. FKO-139-350 MVA
1—600 A. 15 KV G. E. FHKO-136-1328-1000
4—600 A. 15 KV G. E. FHKO-139-750 MVA
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MOTORS—GENERATORS—TRANSFORMERS
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UNIT CAPACITIES—10 TO 1875 KVA
A.C.—50 AND 60 CYCLES
VARIOUS VOLTAGES

A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM
1125	Fairbanks Morse	38D	1600	720
1100	General Motors	16-278A	1600	720
750	General Motors	12-567	1065	720
400	General Motors	8-278A	750	720
300	General Motors	6-567	720	750
250	Baldwin	VO-6	510	450
220	Buckeye	80	480	600

KW	Make	Model	HP	RPM
220	Enterprise	DSG-6	500	450
200	General Motors	6-268A	450	1200
200	General Motors	6-268A	450	1200
100	General Motors	3-268A	150	1200
100	Worthington	BB-5	150	900
80	General Motors	4-71	90	1200
30	Internat'l Harvester	UD-14	45	1200

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TURBO GENERATORS

Qu	KW	Make	Desc.
1	6000	Al Ch.	Condensing 200/250 I.S.P. 2300 v 3/60 Ext. & Surf or Cond.
1	750	G.E.	Condensing — 425 lbs. 750 °TT I.S.P. 440 v. 3 ph. 60 cy.— Built 1944
1	80*	Moore	Non-condensing 140/200 lbs. I.S... L.M lbs. G.S.P. 3/60/480 Volts Direct Connected Exciter
1	400	Westg.	Non-condensing — 125/150 lbs. I.S.P. 5/10 lbs. B.P. — 240/480 v. 3 ph. 60 cy.
1	300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.— 480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

KVA	Make	Type	Volts	Speed
1—5000	Whse		2400/4160	900

MOTOR GENERATOR SETS
3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
1	2500	G.E.	600	600 25 cy	11000
1	1800	G.E.	727	300	13200
1	1000	G.E.	382	275	2300/4600
1	1000	G.E.	900	600	4160/6600
1	1000	G.E.	900	600	6600/13200
1	1000	Whse.	900	600	2300/4160
1	1000	Whse.	900	600	2300/4160
1	800	Whse.	900	550	6600/13200
1	800	Whse.	1200	550/288	2300
1	800	Whse.	900	550	440
1	800	G.E.	720	125	2300
1	750	G.E.	720	250	440-2300
1	500	G.E.	900	125	4160
1	150	G.E.	1200	275	2300
1	150	Whse.	1200	275	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
1—1250	G.E.	RYDDJ	3	6600x550
1—1250	G.E.	RT	3	2388x/13200x440/2300
1—1250	A.C.	OIBC	3	13200x480/2400
1—1250	G.E.	RYDDJ	3	2200x440
1—500	A.C.	OIBC	1	11500x4600
1—300	G.E.	RT	3	24000x2340/480

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TRANSFORMERS

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We carry a large stock of transformers, and invite your inquiries. New Transformers built to your specifications.

PIONEER TRANSFORMER REBUILDERS

We rewind, repair and redesign all makes and sizes.
One Year Guarantee.

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
SINCE 1912 CINCINNATI 27, OHIO

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

TRANSFORMERS

- 1500 KVA G.E., 3 Ph., 4150V., 2300V Pyranol
- 1500 KVA Penn. 3 ph., 4150V. Y 2400V Delta
- 400 KVA Pitts., 1 Ph., 2400/4800V pri. 240/480V sec.
- 200 KVA G.E., 3 Ph., 2400-220 Sec.
- 100 KVA Wagner, 1 Ph., 240V pri., 120V sec.
- 50 KVA G.E., 1 Ph., 13,450V. 120/240 Sec.

SYNCHRONOUS MOTORS

- 300 H.P., Elec. Mach. 720 RPM. 3 Phase 60 cyc. 2200V T E F Canned Outdoor service.
- 150 H.P., G.E., 1800 RPM, 220V.
- 150 H.P., Al. Chal. 360 RPM, 440V.

MOTOR GENERATOR SETS

- 1000 KW G.E., 600 V. 514 RPM, 4000V 3p.
- 300 KW Whse., 275V. 900 R.P.M., 220 V 3ph.
- 175 KVA West., 1 Ph., 220V. Motor 3 Ph., 440V.
- 150 KW. G.E., 120/250V. 1200 RPM, 2300 3ph
- 100 KW G.E., 250V. 900 RPM, 2300V, 3ph.
- 75 KW C.W. 250V. 1200 RPM, 2300/3150V 3ph.

SLIP RING MOTORS

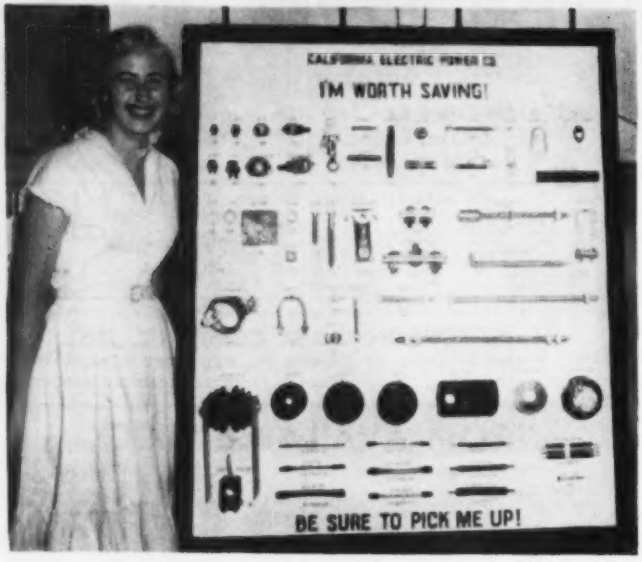
- 300 H.P., West. CW, 600 RPM, 440V.
- 250 HP West., CW, 600 RPM, 440V.

SYNCHRONOUS CONDENSER

- 200 H.P. West. CW, 600 RPM, 440V.
- 2500 KVA Whse. 720 RPM. 2300V with DC EXC.

Large Stock of A.C. and D.C. Equipment

LETTERS TO THE EDITOR



Sincerest Flattery

To the Editor:

We were very much interested in the display board built by Idaho Power Co and shown on Page 9 of the March 17 issue of Electrical World. We think it is a fine way to instill the idea of economy in the minds of our employees.

We took the liberty of reproducing a similar board but wish to give Idaho Power Co full credit for the idea. We intend to display it in all of our districts and already have received some very favorable comments.

I thought you might be interested in a picture of our board.

A. J. Scott
California Electric Power Co
Riverside, California

• Everybody should agree with both companies that there are many things worth picking up.

Hunt for a Precedent

To the Editor:

Two years ago a boy of 13 came in contact with our 2,300-v, single-phase rural line. His hands were severely burned, and he undoubtedly will remain a cripple for life. We now have a suit against us. Here is how the accident happened.

Our line passes closely to a grandstand in a park. In the back of the stand, where our line passes, openings had been made for ventilation. At the time the line was erected (1945) our staff had the owner of the park screen or board these openings so spectators could not reach the wires.

Later when the ownership of the park changed, somebody removed the boards from the openings. Unfortunately, we are unable to find out who removed them, but it must have been employees of the new owner.

The distance of the wires from the opening where the boy was hurt was as follows: First or closest wire to the building, 27 in; second, 55½ in. We cannot understand how the boy managed to reach the two wires but in any case he did. On grabbing one wire no appeciable shock was received, and he seemed to have taken pleasure in playing with this wire. After a while it appears that he decided to try for the second wire to see what would happen. The accident occurred as soon as he touched it.

Would you recall any similar accidents, the location, and the verdict on the case. Or could you refer us to any literature where proceedings and evidence would be in line with our case.

L. A. Long
Superintendent
Electrical Department
City of Edmundston
Edmundston, N. B.

Class H Insulation

To the Editor:

In the April 21 issue of Electrical World, under Technical Notes, I noticed this statement: "Sealed-type dry transformer tanks may rupture under the pressure of generated gas, whether insulation is in the conventional forms of Class A, B, or H, if an external fault lasts long enough to decompose all the turn insulation."

This statement is contrary to what we believe for Class H insulation as we use it for sealed-in-nitrogen transformers through 1,500 kva ratings for network, station auxiliary, and substation application.

For truly Class H transformers, the turn-to-turn and major insulation is primarily glass fiber impregnated by the silicones. Basically, the barrier construction is silicone rubber-coated glass fiber. Test on this barrier insulation by application of a 5,000 F oxygen-acetylene torch demonstrate that combustion will not be supported.

The base materials, such as glass fibers or asbestos, must be thoroughly heat cleaned before impregnation with the silicone resins or rubbers. By heat cleaning is meant the removal of binders and lubricants in the material which will decompose at 220 C or higher temperature. The remaining base material is therefore 100 percent inorganic.

The silicone bondings or impregnating resins or elastomers (silicone rubbers) are therefore the only remaining constituents to be evaluated.

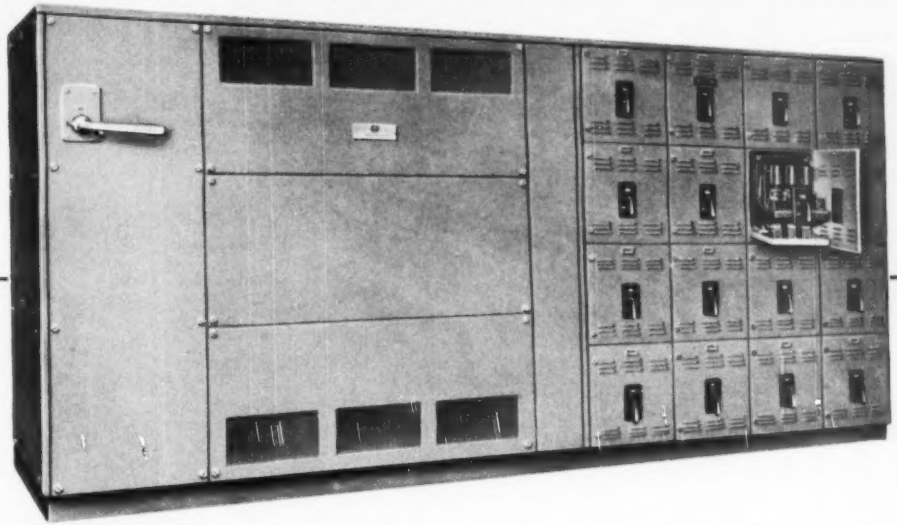
Silicone resins, cured at 250 C, have been evaluated through 600 C (1,112 F) to determine if volatiles are a problem in nitrogen atmosphere at such high temperature. It was found at 600 C exposure for two hours that the noncondensible products were not explosive in nitrogen atmosphere.

For Class H units, transformer tanks properly designed and with relief devices should withstand pressures under extreme conditions of operation.

M. L. Manning
Development Engineer
Pennsylvania Transformer Co.
Canonsburg, Pa.

For ready-assembled substations and easiest installation...

FEDERAL NOARK® POWER CENTERS



YOU'RE ALWAYS ASSURED positive, trouble-free performance with Federal Noark Power Centers. They're factory-assembled and tested. Their coordinated engineering and design is integrated with Federal Noark Drawout Switchgear to meet any application.

The drawout circuit breakers are completely interlocked in all positions to provide safe insertion and removal in the sectionalized compartments. Unique levering operation permits quick, easy and positive contacting of the breaker. Heavily silverplated stationary and movable contacts are reinforced with springs to assure continuous and positive contact pressure.

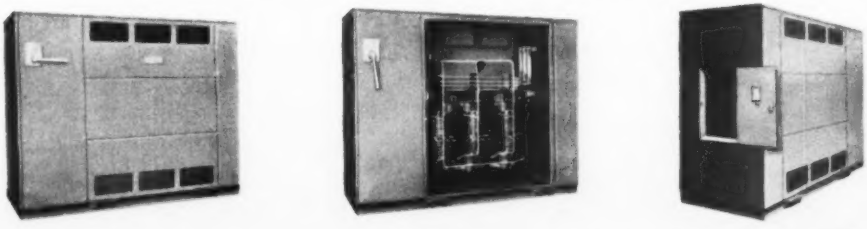
High voltage switches of Federal Noark Power Centers are coordinated with power fuses for complete transformer primary protection. Switches are externally operated and can be locked in "open" or "closed" position. A mechanical interlock can be included to prevent access to fuses except when switch is "open."

The dry type transformer unit is mounted on a structural steel framework enclosed by ventilated, sectionalized steel panels. These can be removed individually for transformer inspection and tap changing.

Complete sectionalizing between the high and low voltage and the individual breakers makes maintenance safe and easy.

Federal Noark Power Centers are available for both indoor and outdoor installation. Write for information regarding any specific application. Federal Electric Products Company, 50 Paris St., Newark 5, N. J.

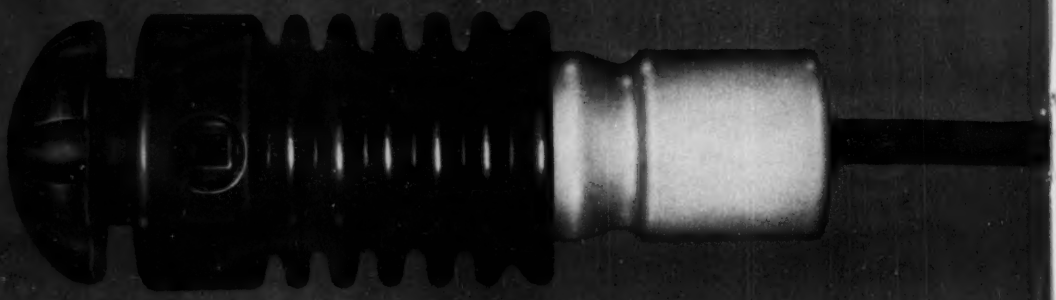
ALL-IN-ONE-UNIT SUBSTATION



FEDERAL NOARK

Federal Noark products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct ★ Sales offices in principal cities.

THERE CAN BE NO DOUBT . . .



KUHLMAN contributed this to the electrical industry

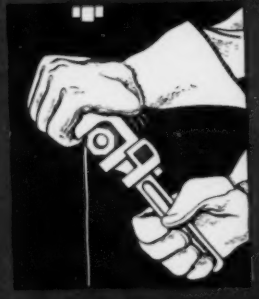
IT BEGAN IN 1939 . . . seeing the need for a safer, more convenient way of making primary line connections, Kuhlman in 1939 introduced the "Quick-Grip" bushing. It was the *first* bushing with insulated connector. For several years thereafter only Kuhlman transformers were equipped with knob-type bushings.

THIS FOLLOWED . . . gradually the upon-demand for this bushing became so great that other transformer manufacturers followed Kuhlman's lead and began equipping their transformers with knob-type bushings. Today these bushings are on the way to becoming a standard feature.

THEN, IN 1952 . . . Kuhlman improved the "Quick-Grip". The bushing is now equipped with a molded hard rubber knob instead of a porcelain knob. This means a bushing that is even safer and more convenient to use.

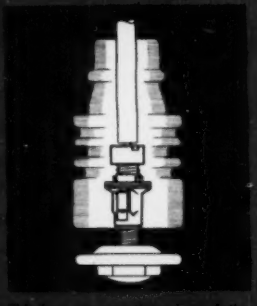
MAKE NO MISTAKE . . . the knob-type bushing is definitely a Kuhlman "first". The "Quick-Grip" . . . with porcelain or rubber knob . . . is distinctively Kuhlman. Kuhlman not only keeps pace with but frequently leads the industry.

The evolution of the "quick-grip" bushing

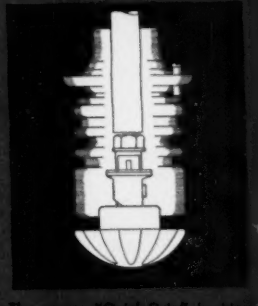


Here is the way primary connections were made prior to the introduction of the "Quick-Grip" bushing. The terminals had to be connected and disconnected with a wrench, a hazardous operation requiring more time, more energy, and more work.

This is the way connections are made with a "Quick-Grip" bushing. No tools are required, no live parts are exposed. The lineman inserts the terminal, twists the knob, and the job is done.



This is a cross-section view of the "Quick-Grip" bushing with the porcelain knob. The metal part was fitted into an insert in the porcelain knob—which was then filled with lead to hold it fast.



The newer "Quick-Grip" bushing has the metal part molded into the hard rubber knob as the knob is formed. The knob has a better shape for gripping, weathers well, and eliminates any risk of cracking or breaking.

Kuhlman ELECTRIC COMPANY, BAY CITY, MICHIGAN

A great name in transformers. Write for descriptive bulletins on Kuhlman power, distribution, dry type, bell-shaped and specialty units.

EXPORT REPRESENTATIVES: *International Standard Electric Corporation*, 67 Broad Street, New York 4, N. Y. Cable Address: Microphone, N. Y.